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<110> Farnet, Chris
Zazopoulos, Emmanuel
Staffa, Alfredo

<120> GENE CLUSTER FOR RAMOPLANIN BIOSYNTHESIS

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- 53 -

Asp Leu His Val Glu Val Ala Tyr Gln Pro Asn Asp Arg Tyr Trp Thr
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Phe Gln Trp Ile Glu Ser Ala Leu Tyr Leu Ala Leu Gly Gly Leu Leu
 305 310 315 320

Leu Ala Val Gly Leu Trp Arg Ile Arg Arg His Val Ile
 325 330

<210> 3
 <211> 304
 <212> PRT
 <213> Actinoplanes sp.

<400> 3

Met Pro His Glu Asp Ser Ser Pro Val Leu Gln Ala Glu Gly Leu Thr
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Lys Arg Tyr Gly Arg Arg Thr Ala Leu Gln Asp Cys Asn Leu Thr Ile
 20 25 30

Pro Arg Gly Arg Val Ile Gly Leu Val Gly Pro Asn Gly Ala Gly Lys
 35 40 45

Ser Thr Leu Leu Gln Leu Ala Cys Gly Leu Ile Thr Pro Ser Glu Gly
 50 55 60

Ser Leu Arg Val Leu Gly Glu Thr Pro Ala Ala Asn Ala Gly His Leu
 65 70 75 80

Ala Lys Val Gly Phe Val Ala Gln Asp Thr Pro Val Tyr Ser Asn Phe
 85 90 95

Thr Val Gly Asp His Leu Lys Met Gly Ala Lys Leu Asn Pro Thr Trp
 100 105 110

Asp Gln Ala Leu Ala Glu Arg Arg Val Ala Gln Val Gly Leu Asn His
 115 120 125

Gly Gln Lys Ala Gly Arg Leu Ser Gly Gly Gln Arg Ala Gln Leu Ala
 130 135 140

Leu Thr Leu Ala Ala Ala Lys Arg Pro Glu Leu Leu Met Phe Asp Glu
 145 150 155 160

Pro Ala Ala Ala Leu Asp Pro Leu Ala Arg Asp Gly Phe Leu Gln Asn
 165 170 175

Leu Leu Glu Phe Val Thr Glu Leu Asp Ala Ser Ala Ile Leu Ser Ser
 180 185 190

His Leu Leu Gly Asp Val Glu Arg Val Cys Asn Tyr Leu Ile Val Leu
 195 200 205

Cys Ala Ser Arg Val Gln Val Ala Gly Asp Val Pro Asp Leu Leu Asn
 210 215 220

Thr His Tyr Arg Ile Val Ala Pro Arg Gly Glu Leu Asp His Pro Pro
 225 230 235 240

Ala Gly Leu Glu Val Ile Arg Ala Gln His Ala Asp Arg Tyr Thr Thr
 245 250 255
 Ala Val Val Arg Gly Asp Gly Ser Arg Pro Ser Thr Trp Thr Ile Glu
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 Pro Ile Gln Leu Glu Glu Leu Val Leu Ala Tyr Met Thr Arg Ala Met
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 290 295 300
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 <212> PRT
 <213> Actinoplanes sp.
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 20 25 30
 Gly Ala Tyr Asp Asp Tyr Arg Ala Gln Cys Pro Ala Gly Gly Asp Cys
 35 40 45
 Ala Gly Pro Leu Gly Gln Phe Ser Leu Asp Tyr Glu Asn Thr Leu Leu
 50 55 60
 Tyr Leu Ala Gly Val Leu Ala Leu Val Pro Gly Leu Leu Gly Met Phe
 65 70 75 80
 Trp Gly Ala Pro Leu Ile Thr Arg Glu Leu Glu Asn Gly Thr Gln Arg
 85 90 95
 Leu Val Trp Asn Gln Ser Val Thr Arg Arg Arg Trp Leu Leu Ile Lys
 100 105 110
 Leu Leu Val Val Gly Leu Ala Cys Met Val Val Ala Gly Val Pro Ser
 115 120 125
 Leu Leu Leu Thr Trp Ala Ala Ala Pro Val Asp Asn Val Ala Asp Asn
 130 135 140
 Arg Phe Ser Thr Val Met Phe Gly Ala Arg Phe Leu Pro Pro Ile Ala
 145 150 155 160
 Tyr Ala Ala Phe Ala Phe Val Leu Gly Thr Leu Ile Gly Leu Leu Val
 165 170 175
 Arg Arg Thr Val Pro Ala Met Ala Leu Thr Leu Val Ala Phe Val Ile
 180 185 190
 Phe Gln Phe Leu Val Pro Asn Leu Val Arg Pro His Leu Met Pro Ala
 195 200 205
 Lys His Leu Val Lys Pro Met Thr Val Ser Ala Ile Asn Glu Ala Lys
 210 215 220

Ser Leu Gly Ser Ile Thr Gly Ala Pro Val Leu Asn Gly Leu Ser Ile
 225 230 235 240
 Ser Gln Gly Trp Ile Thr Asp Val Ser Ala Leu Lys Thr Ala Asp Gly
 245 250 255
 Arg Ser Leu Asp Ala Lys Thr Phe Asp Asn Cys Tyr Met Asn Ala Pro
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 Lys Thr Gly Ala Thr Glu Gly Pro Tyr Gly Asp Val Ala Val Cys Leu
 275 280 285
 Ala Lys Leu Asp Leu His Val Asp Ile Ala Tyr Gln Pro Trp Asn Arg
 290 295 300
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 Gly Leu Leu Ile Gly Ala Ala Val Trp Arg Val Gln Arg Arg Pro Ser
 325 330 335

<210> 5
 <211> 283
 <212> PRT
 <213> Actinoplanes sp.
 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will contain a methionineresidue at t
 his position

<400> 5

Val Arg Ser Ala Val Val Val Gly Thr Gly Leu Ile Gly Thr Ser Val
 1 5 10 15
 Gly Leu Ala Leu Thr Gln Arg Asp Ile Thr Val His Leu Leu Asp Ala
 20 25 30
 Asp Pro Ala Ala Ala Arg Ala Ala Ala Ala Leu Gly Ala Gly Ile Ala
 35 40 45
 Gly Glu Pro Arg Thr Arg Val Asp Val Ala Val Ile Ala Val Pro Pro
 50 55 60
 Ala Ala Val Ala Pro Val Leu Ala Asp Leu Gln Arg Arg Gly Thr Ala
 65 70 75 80
 Arg Val His Thr Asp Ala Ala Ser Val Lys Val Leu Pro Ser Arg Gln
 85 90 95
 Ile Glu Val Leu Gly Cys Asp Ala Ser Ser His Val Gly Gly His Pro
 100 105 110
 Leu Ala Gly Ser Glu Arg Ser Gly Pro His Ala Ala Arg Gly Ser Leu
 115 120 125

Phe Glu Gly Arg Pro Trp Val Leu Ser Pro Gly Arg Arg Ser Ser Thr
 130 135 140
 Ala Ala Val Asp Gly Ala Leu Ala Val Val Ser Ala Cys Gly Ala Thr
 145 150 155 160
 Pro Val Leu Met Ser Ala Glu Glu His Asp Arg Ala Val Ala Leu Val
 165 170 175
 Ser His Val Pro His Leu Val Ala Gly Leu Leu Ala Ala Arg Met Leu
 180 185 190
 Asp Gly Thr Pro Ala Gln Leu Gly Leu Ala Gly Gln Gly Val Arg Asp
 195 200 205
 Thr Thr Arg Ile Ala Gly Gly Arg Ala Ala Leu Trp Thr Glu Ile Leu
 210 215 220
 Ala Ala Asn Ala Gly Ala Val Ala Asp Val Leu Asp Asp Leu Ser Ala
 225 230 235 240
 Glu Leu Ala Ala Thr Ile Ser Ala Leu Arg Glu Leu Glu Ala His Pro
 245 250 255
 Gly Arg Ala Glu Ala Leu Ala Ala Leu Thr Gly Met Leu Gln Arg Gly
 260 265 270
 Val Asp Gly Arg Asp Arg Ile Ala Ala Ser Pro
 275 280
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 <211> 336
 <212> PRT
 <213> Actinoplanes sp.
 <400> 6
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 Asp Glu Thr Gln Met Asn Thr Pro Ser Met Met Arg Val Glu Trp Leu
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 Pro Val Asp Ser Leu Glu Met Leu Asp Ser Pro Arg Leu Ala Gly Glu
 35 40 45
 Asp Pro Arg His Thr Gln Met Leu Ala Ser Leu Asp Ala Glu Leu Pro
 50 55 60
 Pro Ile Ile Val His Arg Ala Ser Met Arg Val Ile Asp Gly Ala His
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 Arg Leu Gly Ala Ala Arg Leu Arg Gly Asp Glu Leu Ile Lys Ala Ala
 85 90 95
 Met Phe Glu Gly Ser Glu Gln Glu Ala Phe Val Leu Gly Val Lys Ala
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 Asn Ile Ala His Gly Leu Pro Leu Ser Thr Ala Asp Arg Thr Arg Ala
 115 120 125

Ala Glu Arg Ile Ile Glu Ser His Pro Ser Trp Ser Asp Arg Thr Ile
130 135 140

Ala Ala Ser Ser Gly Leu Ser Ala Arg Thr Val Gly Asn Ile Arg Arg
145 150 155 160

Arg Leu Glu Leu Ser Gly Asp Ile Gly Gln Gly Ser Arg Thr Arg Val
165 170 175

Gly Arg Asp Gly Arg Val Arg Pro Leu Asp Asn Ser Glu Gly Arg Leu
180 185 190

Lys Ala Val Ser Tyr Ile Gln Gln Gln Pro Asp Ala Ser Leu Arg Glu
195 200 205

Ile Ala Lys Asn Ala Gly Val Ser Pro Ser Thr Ala Arg Asp Val Arg
210 215 220

Asn Arg Leu Gln Arg Gly Glu Asp Pro Leu Pro Gly Pro Arg Arg Thr
225 230 235 240

Gly Gly His Arg Asp Asp Ile Ser Phe Asp Lys Glu Asn Thr Ile Arg
245 250 255

Leu Leu Glu Pro Thr Val Arg Ser Ile Leu Gln Gly Leu Lys Asn Asp
260 265 270

Pro Ser Leu Arg Phe Thr Glu Ser Gly Arg Asn Leu Leu Arg Trp Val
275 280 285

Leu Ala Arg Thr Val Gln Asp Asp Glu Trp Lys Asp Met Leu Asp Ala
290 295 300

Val Pro Ser His Cys Thr Tyr Val Leu Ala Asn Val Ala Arg Arg Cys
305 310 315 320

Ser Gln Glu Trp Leu Glu Phe Ala Glu Thr Leu Glu Lys Asn Ala Ala
325 330 335

<210> 7

<211> 444

<212> PRT

<213> Actinoplanes sp.

<400> 7

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Glu Asp Leu His Gln Ser Leu Ser Asp Pro Leu Leu Asp Thr Met Asn
20 25 30

Phe Leu Asn Glu Val Thr Ala Arg Tyr Pro Arg Ala Val Ser Phe Ala
35 40 45

Pro Gly Arg Pro Phe Asp Gly Phe Phe Asp Val Glu Gln Ile Phe Arg
50 55 60

Gly Ile Arg Gly Tyr Leu Glu His Leu Ala Gly Gln Gly Arg Ser Pro
65 70 75 80

Ala Glu Ile Arg Asp Ala Val Phe Gln Tyr Gly Pro Ala Ala Gly Arg
 85 90 95
 Ile Arg Glu Val Ile Ala Gln Trp Leu Arg Arg Asp Glu Gly Ile Asp
 100 105 110
 Val Ala Pro Glu Ser Ile Val Val Thr Val Gly Ala Gln Glu Ala Met
 115 120 125
 Leu Leu Ala Leu Arg Ala Leu Ile Arg Asp Glu Arg Asp Ala Leu Phe
 130 135 140
 Val Ala Ser Pro Cys Tyr Val Gly Ile Thr Gly Ala Ala Arg Leu Leu
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 Asp Ile Asp Pro Val Pro Val Ala Glu Arg Glu Asp Gly Phe His Pro
 165 170 175
 Glu Asp Leu Ala Arg Ala Val His Ala Glu Leu Ser Arg Gly Arg Arg
 180 185 190
 Pro Arg Ala Phe Tyr Val Val Pro Asp His Thr Asn Pro Ser Gly Ala
 195 200 205
 Thr Met Pro Leu Glu Ala Arg His Ala Leu Leu Asp Leu Ala Gly Glu
 210 215 220
 Leu Gly Leu Leu Val Ile Glu Asp Ser Pro Tyr Arg Leu Val Ser Pro
 225 230 235 240
 Gly Gln Gln Leu Pro Ser Leu Lys Ala Leu Asp Pro Gly Arg His Val
 245 250 255
 Val His Leu Gly Ser Phe Ser Lys Thr Leu Phe Pro Gly Ala Arg Val
 260 265 270
 Gly Phe Ala Ile Ala Asp Gln Pro Val Ser Asp Ala Ala Gly Gly Ala
 275 280 285
 Gly Leu Leu Ala Asp Glu Leu Ala Lys Val Lys Ser Met Val Thr Val
 290 295 300
 Asn Thr Ser Pro Leu Ser Gln Ala Ala Val Ala Gly Met Leu Leu Ala
 305 310 315 320
 Ala Gly Gly Thr Ala Ala Glu Ala Ser Ala Glu Ser Ser Ala His Tyr
 325 330 335
 Gly Ala Ala Met Arg Arg Thr Leu Asp Arg Leu Glu Glu His Leu Pro
 340 345 350
 Ala Ser Phe Arg Ala Arg Thr Gly Val Arg Trp Asn Arg Pro Ser Gly
 355 360 365
 Gly Phe Phe Leu Ala Val Asn Val Pro Phe Thr Ala Asp Asn Ala Ala
 370 375 380
 Leu Ser Arg Ser Ala Glu Asp His Gly Val Ile Trp Thr Pro Met Ser
 385 390 395 400
 Tyr Phe Tyr Pro Ala Gly Gly Gly Glu Gln Gly Ile Arg Leu Ser Ile

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405                               410                               415
Ser Tyr Leu Thr Pro Glu Glu Ile Asp Glu Gly Val Lys Arg Leu Ala
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Gly Phe Ile Thr Thr Glu Ile Ala Ala Leu Arg Pro
      435                               440

<210> 8
<211> 356
<212> PRT
<213> Actinoplanes sp.

<220>
<221> misc_feature
<222> (1)..(1)
<223> V represents a non-standard initiator codon. It is expected that
      the biosynthesized protein will have a formylmethionine residue
      at this position

<400> 8

Val Thr Ala Thr Ala Leu Leu Pro Leu Thr Leu Ala Asp Tyr Glu Gln
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Leu Ala Gln Ala Arg Met Glu Pro Pro Val Trp Asp Phe Ile Ala Gly
      20      25      30
Gly Ala Gly Glu Glu Leu Thr Leu Ala Ala Asn Thr Ala Ala Phe Ala
      35      40      45
Pro Pro Arg Leu Arg Pro Arg Val Leu Thr Gly Ala Gly Ala Pro Asp
      50      55      60
Thr Gly Thr Thr Ile Leu Gly Arg Arg Trp Ala Ala Pro Ile Gly Val
65      70      75      80
Ala Pro Leu Gly Tyr His Thr Leu Val Asp Pro Ala Gly Glu Val Ala
      85      90      95
Thr Ala Ala Ala Ala Gly Ala Ala Gly Leu Pro Leu Val Val Ser Thr
      100     105     110
Phe Ser Gly Arg Thr Val Glu Asp Ile Ala Ala Ala Thr Thr Ala Pro
      115     120     125
Arg Trp Leu Gln Val Tyr Cys Phe Arg Asp Arg Ala Val Thr Ala Ala
      130     135     140
Leu Val Thr Arg Ala Val Arg Ala Gly Phe Glu Ala Leu Val Leu Thr
145     150     155     160
Val Asp Ala Pro Arg Leu Gly Arg Arg Leu Arg Asp Ile Arg Asn Asp
      165     170     175
Phe Arg Leu Pro Pro Gly Val Ala Pro Ala Asn Leu Thr Gly Asp Gly
      180     185     190
Phe Ala Ser Pro Ser Gly His Ala Leu Gly Ala Phe Asp Ala Ala Met
195     200     205

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Gly Phe Ile Thr Thr Glu Ile Ala Ala Leu Arg Pro
435 440

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<210>      8
<211>      356
<212>      PRT
<213>      Actinoplanes sp.

<220>
<221>      misc_feature
<222>      (1)..(1)
<223>      V represents a non-standard initiator codon.  It is expected that
          the biosynthesized protein will have a formylmethionine residue
          at this position

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<400> 8

Val	Thr	Ala	Thr	Ala	Leu	Leu	Pro	Leu	Thr	Leu	Ala	Asp	Tyr	Glu	Gln
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Leu Ala Gln Ala Arg Met Glu Pro Pro Val Trp Asp Phe Ile Ala Gly
20 25 30

Gly Ala Gly Glu Glu Leu Thr Leu Ala Ala Asn Thr Ala Ala Phe Ala
35 40 45

Pro Pro Arg Leu Arg Pro Arg Val Leu Thr Gly Ala Gly Ala Pro Asp
50 55 60

Thr Gly Thr Thr Ile Leu Gly Arg Arg Trp Ala Ala Pro Ile Gly Val
65 70 75 80

Ala Pro Leu Gly Tyr His Thr Leu Val Asp Pro Ala Gly Glu Val Ala
85 90 95

Thr Ala Ala Ala Ala Gly Ala Ala Gly Leu Pro Leu Val Val Ser Thr
100 105 110

Phe Ser Gly Arg Thr Val Glu Asp Ile Ala Ala Ala Thr Thr Ala Pro
115 120 125

Arg Trp Leu Gln Val Tyr Cys Phe Arg Asp Arg Ala Val Thr Ala Ala
130 135 140

Leu Val Thr Arg Ala Val Arg Ala Gly Phe Glu Ala Leu Val Leu Thr
145 150 155 160

Val Asp Ala Pro Arg Leu Gly Arg Arg Leu Arg Asp Ile Arg Asn Asp
165 170 175

Phe Arg Leu Pro Pro Gly Val Ala Pro Ala Asn Leu Thr Gly Asp Gly
180 185 190

Phe Ala Ser Pro Ser Gly His Ala Leu Gly Ala Phe Asp Ala Ala Met
195 200 205

Asp Trp Thr Val Val Ala Trp Leu Arg Glu Leu Ser Gly Leu Pro Val
 210 215 220
 Leu Leu Lys Gly Val Leu Thr Ala Asp Gly Ala Arg Arg Ala Leu Asp
 225 230 235 240
 Ala Gly Ala Asp Gly Ile Val Val Ser Asn His Gly Gly Arg Gln Leu
 245 250 255
 Asp Gly Val Pro Ala Thr Leu Asp Val Leu Pro Glu Val Val Ala Ala
 260 265 270
 Val Ala Gly Arg Cys Pro Val Leu Leu Asp Gly Gly Val Arg Arg Gly
 275 280 285
 Arg Asp Val Leu Leu Ser Leu Ala Leu Gly Ala Asp Ala Val Leu Val
 290 295 300
 Gly Arg Pro Val Leu Tyr Gly Leu Ala Val Gly Gly Thr Ala Gly Val
 305 310 315 320
 Arg His Val Leu Asp Ile Leu Ala Gly Glu Leu Thr Asp Asp Met Ala
 325 330 335
 Leu Ala Gly Val Ala Ser Pro Ala Asp Ala Gly Ala Asp Leu Ala Gly
 340 345 350
 Pro Val Ala Pro
 355

<210> 9
 <211> 640
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine at this
 position

<400> 9

Val Ala Thr Ile Asp Gly Pro Asp Leu Gly Val Ile Gly Leu Arg Val
 1 5 10 15
 Asp Gly Leu Ile Pro Met Gln Lys Val Arg Pro Gly Thr Val Arg Arg
 20 25 30
 Ile Leu Pro Tyr Ala Lys Lys His Arg Trp Ser Leu Ala Val Ala Leu
 35 40 45
 Leu Met Thr Val Val Asp Ala Ala Leu Thr Val Ala Asn Pro Leu Leu
 50 55 60
 Leu Lys Gln Ile Ile Asp Arg Gly Ile Val Ala Gly Arg Leu Asp Val
 65 70 75 80

Val	Val	Gly	Leu	Ser	Leu	Val	Val	Ala	Gly	Leu	Ala	Leu	Val	Asn	Val		
				85					90					95			
Ala	Ala	Ile	His	Val	Gln	Thr	Leu	Ala	Ser	Gly	Arg	Val	Gly	Gln	Gly		
			100					105					110				
Leu	Ile	Tyr	Asp	Leu	Arg	Thr	Lys	Val	Phe	Ala	His	Val	Met	Arg	Gln		
		115					120					125					
Pro	Leu	Ala	Phe	Phe	Thr	Arg	Ala	Gln	Thr	Gly	Ser	Leu	Val	Ser	Arg		
		130				135					140						
Leu	Asn	Thr	Asp	Val	Val	Gly	Ala	Glu	Gln	Ala	Met	Thr	Ser	Met	Ile		
145					150					155					160		
Thr	Gln	Thr	Val	Ser	Thr	Val	Leu	Thr	Val	Val	Leu	Val	Ile	Gly	Ala		
				165					170					175			
Met	Phe	Tyr	Leu	Ser	Trp	Ala	Ile	Ala	Leu	Val	Ala	Leu	Val	Leu	Ile		
			180					185					190				
Pro	Leu	Phe	Phe	Leu	Pro	Gly	Lys	Leu	Ile	Ala	Gly	Arg	Leu	Glu	Arg		
		195					200					205					
Leu	Ala	Arg	Gly	Gly	Met	Gln	Val	Asp	Ala	Glu	Leu	Gly	Ser	Met	Met		
		210				215					220						
Asn	Glu	Arg	Phe	Asn	Val	Ser	Gly	Ala	Met	Leu	Val	Lys	Leu	Tyr	Gly		
225					230					235					240		
Arg	Pro	Glu	Ser	Glu	Glu	Thr	Ala	Phe	Ala	Gly	Arg	Ala	Ala	Arg	Val		
				245					250					255			
Arg	Asp	Ile	Ala	Ile	Ser	Met	Gly	Val	His	Ala	Arg	Leu	Leu	Phe	Ile		
			260					265					270				
Ile	Ala	Thr	Leu	Leu	Thr	Thr	Val	Thr	Thr	Ala	Met	Val	Tyr	Gly	Phe		
		275					280					285					
Gly	Gly	Ala	Leu	Val	Ile	Asp	Gly	Thr	Leu	Gly	Ile	Gly	Thr	Leu	Val		
	290					295					300						
Ala	Met	Val	Ala	Leu	Leu	Ala	Gln	Leu	Tyr	Gly	Pro	Val	Asn	Gln	Leu		
305					310					315					320		
Thr	Asn	Ile	Gln	Val	Asp	Val	Val	Thr	Ala	Leu	Val	Ser	Phe	Asp	Arg		
				325					330					335			
Val	Phe	Glu	Val	Leu	Asp	Leu	Asp	Pro	Leu	Val	Lys	Glu	Arg	Pro	Gly		
			340					345					350				
Ala	Arg	Ala	Leu	Pro	Ala	Ala	Glu	Pro	Gly	Arg	Ser	Ala	Ala	Pro	Asp		
			355				360					365					
Ile	Glu	Phe	Asp	Asn	Val	Val	Phe	Arg	Tyr	Pro	Gly	Ala	Asp	Glu	Val		
	370					375					380						
Ser	Leu	Ala	Ser	Leu	Glu	Thr	Val	Ala	Gln	Arg	Ser	Ser	Asp	Gly	Thr		
385					390					395					400		
Ala	Glu	Arg	Pro	Val	Leu	Asn	Gly	Ile	Ser	Phe	Leu	Ala	Pro	Ala	Gly		

405										410					415				
Lys	Leu	Thr	Ala	Leu	Val	Gly	Pro	Ser	Gly	Ala	Gly	Lys	Thr	Thr	Ile				
			420					425					430						
Thr	His	Leu	Val	Pro	Arg	Leu	Tyr	Asp	Thr	Thr	Ser	Gly	Thr	Val	Arg				
		435					440					445							
Ile	Ala	Gly	His	Asp	Val	Arg	Asp	Leu	Thr	Leu	Arg	Ser	Leu	Ser	Glu				
	450					455					460								
Ser	Ile	Gly	Val	Val	Thr	Gln	Asp	Ala	His	Leu	Phe	His	Asp	Thr	Ile				
465					470					475					480				
Arg	Ala	Asn	Leu	Leu	Tyr	Gly	Arg	Pro	Asp	Ala	Gly	Glu	Arg	Asp	Leu				
			485					490						495					
Val	Ala	Ala	Cys	Glu	Ala	Ala	Arg	Ile	Trp	Glu	Met	Val	Ser	Ser	Leu				
			500					505					510						
Pro	Asp	Gly	Leu	Asp	Thr	Val	Val	Gly	Asp	Arg	Gly	Tyr	Arg	Leu	Ser				
		515					520					525							
Gly	Gly	Glu	Lys	Gln	Arg	Leu	Ala	Leu	Ala	Arg	Leu	Leu	Leu	Lys	Ser				
	530					535					540								
Pro	Pro	Val	Val	Val	Leu	Asp	Glu	Ala	Thr	Ala	His	Leu	Asp	Ser	Glu				
545					550					555					560				
Ser	Glu	Ala	Ala	Ile	Gln	Arg	Ala	Leu	Asp	Thr	Ala	Leu	Ala	Gly	Arg				
			565					570						575					
Thr	Ser	Leu	Val	Ile	Ala	His	Arg	Leu	Ala	Thr	Ile	Leu	Asp	Ala	Asp				
		580						585					590						
Gln	Ile	Leu	Val	Ile	Asp	Asp	Gly	Arg	Val	Val	Glu	Arg	Gly	Thr	His				
	595						600					605							
Asp	Glu	Leu	Ile	Ala	His	Gly	Gly	Leu	Tyr	Ala	Glu	Leu	Tyr	Arg	Thr				
	610					615					620								
Gln	Phe	Ala	Gly	Gln	Arg	Thr	Glu	Glu	Arg	Gln	Pro	Ala	Val	Pro	Ser				
625					630					635					640				

<210> 10

<211> 271

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 10

Val	Ser	Ala	Ala	Gly	Ser	Gly	Phe	Val	Thr	Thr	Asn	Gly	Val	Arg	Leu
1				5					10					15	

Ala Tyr Arg Arg Ser Gly Ala Gly Glu Pro Val Leu Met Ile Met Gly
 20 25 30
 Ser Gly Ser Ala Gly Gln Thr Trp Thr Val His Gln Thr Pro Ala Leu
 35 40 45
 His Glu Ala Gly Tyr Ser Thr Val Val Phe Asp Ser Arg Gly Ile Pro
 50 55 60
 Pro Ser Asp Val Pro Ala Gly Lys Tyr Ser Leu Ala Asp Met Thr Ala
 65 70 75 80
 Asp Thr Arg Gly Leu Ile Glu Ala Leu Asp Leu Ala Pro Cys Arg Ile
 85 90 95
 Val Gly Thr Ser Leu Gly Ala Met Ile Ala Gln Glu Leu Ala Val Asp
 100 105 110
 His Pro Glu Leu Val Arg Cys Ala Val Leu Ile Ala Thr Leu Ala Arg
 115 120 125
 Pro Asp Ala Ala Arg Ala Ala Gln Asn Gln Ala Asp Ile Asp Leu Leu
 130 135 140
 Glu Ser Gly Val Thr Leu Pro Ala Ala Tyr Glu Ala Ala Thr Ala Val
 145 150 155 160
 Phe Lys Met Phe Ser Pro Ala Thr Leu Asn Asp Asp Val Ala Val Arg
 165 170 175
 Glu Trp Leu Asp Ile Phe Glu Leu Ser Gly Thr Gly Val Ser Ala Gly
 180 185 190
 Gly Gln Ala Trp Ala Glu Leu Thr Gly Asp Arg Arg Ala Ala Leu Arg
 195 200 205
 Ser Val Thr Ala Pro Cys Arg Val Ile Ser Phe Ala Asp Asp Leu Ile
 210 215 220
 Thr Pro Pro His Leu Ala Ala Glu Val Ala Glu Ala Ile Pro Asp Cys
 225 230 235 240
 Asp Leu Val Glu Ile Ser Arg Cys Gly His Leu Gly Tyr Leu Glu Arg
 245 250 255
 Pro Asp Ala Val Asn Ala Ala Ile Leu Glu Phe Leu Asp Ser His
 260 265 270

<210> 11
 <211> 529
 <212> PRT
 <213> Actinoplanes sp.

<400> 11

Met Gly Asn Ala Asp Gln Pro Arg Tyr Leu Arg Ser Asn Val Ile Ala
 1 5 10 15
 Glu Pro Leu Val Asp Arg Phe Tyr Ala Trp Leu His Thr Val Ala Pro
 20 25 30

Val Pro Ala Ser Met Asn Leu Ala Phe Leu Gln Val Pro Leu Leu Glu
35 40 45
Ser Tyr Leu Gln Ser Pro Pro Val His Val Ala Ala Ser Thr Asn Pro
50 55 60
Lys Met Arg Gly Gly Tyr Phe Val Ala Val Glu Glu Ser Arg Ser Asp
65 70 75 80
Glu Val Ala Glu Leu Leu Lys Thr Ile Lys Asn Glu Arg Ala Asp Met
85 90 95
Leu Gly Phe Ala Ala Ala Val Ala Glu Ala Glu Asp Leu Ile Arg Glu
100 105 110
Asn Ala Val Gly Tyr Asp Leu Thr Pro Leu Tyr Pro Arg Leu Pro Ala
115 120 125
Ala Leu Asn Gly Leu Val Glu Ile Ala Tyr Asp Thr Ser Asn Gln Pro
130 135 140
Ser Leu His Phe Leu Glu Pro Leu Leu Tyr Arg Ser Pro Ala Tyr Asp
145 150 155 160
Glu Arg Arg Gln Ser Val Gln Leu Ser Leu Asp Asp Gly Val Glu Arg
165 170 175
Pro Phe Ile Leu Ser Thr Pro Arg Leu Pro Arg Ala Gly Val Leu Asp
180 185 190
Leu Pro Leu Pro Leu Arg His Pro Gly Leu Thr Glu Leu Phe Asp Ala
195 200 205
Arg Val Arg Pro Thr Ser Leu Asn Arg Leu Arg Glu Ala Leu Glu Leu
210 215 220
Asp Asp Ala Gly Ala Ala Ala Leu Asp Ala Leu Leu Thr Asp Glu Pro
225 230 235 240
Ser Leu Ser Pro Asp Arg His Ile Glu Ser Gly Gly Arg Val Arg Tyr
245 250 255
Tyr Gly His Ala Cys Val Val Met Gln Thr Glu Gln Ala Ala Val Val
260 265 270
Thr Asp Pro Phe Ile Ser Thr Asp Asn Arg His Gly Asp Arg Tyr Thr
275 280 285
Leu Asp Asp Leu Pro Asp His Ile Asp Leu Val Leu Ile Thr His Gly
290 295 300
His Gln Asp His Ile Val Leu Glu Thr Leu Leu Gln Leu Arg Gly Arg
305 310 315 320
Ile Gly Thr Val Val Val Pro Arg Thr Ser Arg Gly Asn Leu Pro Asp
325 330 335
Pro Ser Ile Ala Leu Tyr Leu Arg Arg Ile Gly Phe Thr Val Val Glu
340 345 350

Val Glu Glu Phe Asp Glu Val Pro Phe Pro Gly Gly Thr Val Thr Ala
 355 360 365
 Thr Pro Phe Leu Gly Glu His Ala Asp Leu Asp Ile Arg Gly Lys Ser
 370 375 380
 Thr Tyr Phe Val Arg Met Ala Gly Arg Thr Ile Phe Ile Gly Ala Asp
 385 390 395 400
 Ser Ser Gly Ile Asp Pro Val Leu Tyr Arg Tyr Ile Arg Asp His Val
 405 410 415
 Gly Gln Val Asp Met Ala Phe Leu Gly Met Glu Cys Asp Gly Ala Pro
 420 425 430
 Leu Asn Trp Leu Tyr Lys Gly Leu Leu Thr Lys Pro Val Asn Lys Lys
 435 440 445
 Met Ser Ala Ser Arg Arg Leu Ser Gly Ser Asn Ala Glu Gln Ala Gly
 450 455 460
 Ala Ile Met Thr Glu Leu Gly Ala Thr Ala Gly Tyr Ile Tyr Ala Met
 465 470 475 480
 Gly Glu Glu Ser Trp Gln Gly His Val Met Ala Thr Thr Tyr Asn Glu
 485 490 495
 Asp Thr Tyr Gln Leu Lys Gln Ile Asp Glu Phe Leu Ala Trp Cys Ala
 500 505 510
 Asp Arg Gly Phe Thr Ala Glu His Leu Phe Asn Lys Arg Glu Trp Arg
 515 520 525

Trp

<210> 12
 <211> 90
 <212> PRT
 <213> Actinoplanes sp.

<400> 12

Met Ser Glu Thr Asp Leu Ser Ala Ala Arg His Thr Pro Glu Gln Ile
 1 5 10 15
 Arg Ser Trp Leu Ile Asp Arg Ile Ala Tyr Tyr Val Met Leu Pro Thr
 20 25 30
 Gln Glu Ile Glu Pro Asp Val Ser Leu Ala Glu Tyr Gly Leu Asp Ser
 35 40 45
 Val Tyr Ala Phe Ala Leu Cys Gly Glu Ile Glu Asp Thr Leu Gly Ile
 50 55 60
 Pro Ile Glu Pro Thr Leu Leu Trp Asp Val Asp Thr Val Ala Thr Leu
 65 70 75 80
 Thr Ala His Leu Ala Asp Arg Val Asn Arg
 85 90

<210> 13
 <211> 1051
 <212> PRT
 <213> Actinoplanes sp.

 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 13

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Val Pro Thr Pro Asp Leu Arg Pro Leu Thr Pro Ala Gln Leu Ala Val
1              5              10              15

Trp His Ala Gln Gln Leu Ala Pro His Ser Pro Val Tyr Gln Val Gly
20              25              30

Glu Phe Val Glu Ile Asp Gly Glu Cys Asp Pro Asp Leu Leu Val Ala
35              40              45

Ala Leu Arg Gln Val Met Gly Glu Ala Glu Ser Ala Arg Leu Arg Phe
50              55              60

Arg Val Ile Asp Gly Thr Pro Trp Gln Tyr Val Ala Glu Asp Gly Asp
65              70              75              80

Asp Pro Ile Gln Val Val Asp Leu Gly Ala Ala Ala Asp Pro Arg Ala
85              90              95

Ala Ala Leu Gly Arg Met Ala Ala Asp Leu Asp Arg Pro Gly Asp Leu
100             105             110

Arg Asp Gly Pro Leu Val Glu His His Val Tyr Leu Leu Gly Glu Gly
115             120             125

Arg Val Ile Trp Tyr His Arg Ala His His Ile Val Cys Asp Gly Gly
130             135             140

Ser Leu Gly Ile Val Ala Ser Arg Val Ala Gly Val Tyr Ser Ala Leu
145             150             155             160

Ala Ala Gly Gly Asp Val Arg Pro Gly Ala Leu Pro Pro Leu Ser Val
165             170             175

Leu Leu Ser Ala Ala Asp Ala Tyr Glu Arg Ser Gly Asp Arg Asp Arg
180             185             190

Asp Arg Glu His Trp Arg Ser Ala Leu Ala Gly Leu Pro Ala Glu Leu
195             200             205

Leu Ala Gly Ala Gly Arg Pro Arg Pro Leu Pro Gly Pro Pro Val Arg
210             215             220

His Glu His Asp Leu Ser Ala Ala Glu Ala Gly Arg Leu Arg Ala Gly
225             230             235             240

Ala Arg Arg Leu Arg Thr Ser Val Ala Gln Ala Gly Ile Ala Ala Ala

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245										250					255				
Ala	Leu	Tyr	Gln	His	Arg	Leu	Thr	Gly	Ala	Arg	Asp	Val	Leu	Val	Ala				
			260					265					270						
Val	Pro	Val	Ala	Gly	Arg	Thr	Thr	Arg	Pro	Glu	Phe	Asp	Val	Pro	Gly				
		275					280					285							
Met	Thr	Ser	Asn	Val	Val	Pro	Val	Arg	Leu	Ala	Val	Thr	Pro	Ala	Thr				
	290					295					300								
Thr	Val	Gly	Glu	Leu	Leu	Arg	Asp	Val	Ala	Arg	Gly	Val	Arg	Asp	Gly				
305				310					315						320				
Leu	Arg	His	Gln	Arg	Tyr	Pro	Tyr	Pro	Asn	Ile	Val	Asp	Asp	Leu	Gly				
			325						330					335					
Leu	Ala	Asp	Arg	Ala	Ala	Leu	Arg	Pro	Val	Thr	Val	Asn	Ala	Leu	Ala				
		340						345					350						
Leu	Gly	Arg	Pro	Leu	Arg	Phe	Gly	Ser	Ala	Val	Gly	Val	Arg	Ser	Gly				
	355						360					365							
Leu	Ser	Ala	Gly	Pro	Val	Asp	Asp	Val	Thr	Ile	Gly	Leu	Tyr	Glu	Lys				
	370					375					380								
Val	Ser	Gly	Gly	Gly	Met	Gln	Thr	Ile	Ala	Glu	Leu	Asn	Pro	Gly	Arg				
385					390					395					400				
Thr	Asp	Arg	Pro	Asp	Ala	Ala	Glu	Val	Ser	Arg	Trp	Phe	Arg	Thr	Leu				
			405						410					415					
Leu	Arg	Gly	Leu	Ala	Glu	Ser	Asp	Ala	Gly	Asp	Pro	Val	Ala	Arg	Ile				
		420						425					430						
Asp	Ile	Val	Asp	Glu	Pro	Glu	Arg	Arg	Arg	Leu	Leu	Asp	Glu	Trp	Asn				
	435						440					445							
Ala	Thr	Ala	Ala	Pro	Ser	Ser	Asp	Thr	Val	Leu	Ala	Arg	Phe	Glu	Glu				
	450					455					460								
Gln	Ala	Ala	Arg	Thr	Pro	Glu	Ala	Pro	Ala	Val	Val	Cys	Gly	Asp	Val				
465					470					475					480				
Thr	Val	Thr	Tyr	Ala	Glu	Leu	Glu	Ala	Gly	Ala	Asn	Arg	Leu	Ala	Arg				
			485						490					495					
Val	Leu	Arg	Ala	Arg	Gly	Ala	Gly	Pro	Glu	Ser	Val	Val	Ala	Leu	Cys				
		500						505					510						
Leu	Pro	Arg	Gly	Pro	Glu	Val	Val	Thr	Gly	Ile	Leu	Ala	Ala	Trp	Lys				
		515					520					525							
Ala	Gly	Ala	Ala	Tyr	Leu	Pro	Val	Asp	Thr	Glu	Leu	Pro	Ala	Glu	Arg				
	530					535					540								
Val	Ala	Tyr	Leu	Leu	Gly	Asp	Ser	Ala	Ala	Ala	Val	Arg	Leu	Gly	Thr				
545					550					555					560				
Ala	Glu	Thr	Leu	Ala	Ala	Leu	Pro	Asp	Gly	Pro	Ala	Ala	Asp	Val	Asp				
			565						570					575					

Val	His	Ala	Pro	Glu	Ile	Ala	Arg	Glu	Ser	Pro	Ser	Pro	Leu	Arg	Leu	580	585	590
Glu	Pro	Leu	Pro	Asp	Gln	Leu	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	595	600	605
Thr	Gly	Leu	Ser	Lys	Gly	Val	Gly	Val	Ser	His	Gly	Gly	Leu	Ala	Asn	610	615	620
Tyr	Val	Gly	Trp	Ala	Ser	Val	Leu	Tyr	Gly	Gly	Leu	Ser	Ala	Pro	Leu	625	630	635
His	Ser	Ser	Leu	Ala	Phe	Asp	Leu	Thr	Val	Thr	Ser	Val	Phe	Val	Pro	645	650	655
Leu	Val	Cys	Gly	Gly	Ser	Val	Val	Val	Ser	Ala	Ala	Gly	Gly	Gly	Arg	660	665	670
Gly	Leu	Ala	Ser	Leu	Leu	Ala	Ala	Gly	Asp	Gly	Phe	Ser	Leu	Val	Lys	675	680	685
Val	Val	Pro	Gly	His	Leu	Arg	Leu	Leu	Ala	Glu	Leu	Val	Pro	Ala	Gly	690	695	700
Glu	Met	Ala	Ala	Val	Gly	Ser	Leu	Val	Ala	Gly	Gly	Glu	Val	Leu	Ala	705	710	715
Gly	Gly	Asp	Val	Arg	Glu	Trp	Leu	Ser	Arg	Val	Pro	Gly	Ser	Val	Val	725	730	735
Val	Asn	Glu	Tyr	Gly	Pro	Thr	Glu	Thr	Val	Val	Gly	Cys	Ser	Val	Phe	740	745	750
Ser	Val	Ala	Ala	Gly	Asp	Val	Val	Gly	Asp	Val	Val	Pro	Val	Gly	Arg	755	760	765
Pro	Val	Ala	Asn	Thr	Arg	Leu	Phe	Val	Leu	Asp	Glu	Gly	Leu	Arg	Pro	770	775	780
Val	Pro	Ala	Gly	Val	Ala	Gly	Glu	Leu	Tyr	Val	Ala	Gly	Ser	Gln	Val	785	790	795
Ala	Arg	Gly	Tyr	Val	Gly	Arg	Ser	Gly	Leu	Thr	Ala	Ser	Arg	Phe	Val	805	810	815
Ala	Cys	Pro	Phe	Gly	Val	Gly	Glu	Arg	Met	Tyr	Arg	Thr	Gly	Asp	Val	820	825	830
Val	Arg	Leu	Ala	Gly	Gly	Asp	Leu	Val	Phe	Val	Gly	Arg	Val	Asp	Glu	835	840	845
Gln	Val	Lys	Ile	Arg	Gly	Tyr	Arg	Val	Glu	Pro	Asp	Glu	Val	Arg	Leu	850	855	860
Val	Val	Ala	Gly	His	Pro	Arg	Val	Ala	Gly	Ala	Ala	Val	Val	Ala	Arg	865	870	875
Pro	Asp	Ala	Val	Gly	Glu	Arg	Gln	Leu	Val	Ala	Tyr	Val	Val	Ala	Ala	885	890	895

Gly Glu Pro Ala Gly Leu Ala Glu Ser Val Arg Ala His Val Ala Glu
 900 905 910
 Arg Leu Pro Glu Tyr Met Val Pro Ala Ala Val Val Thr Leu Asp Glu
 915 920 925
 Ile Pro Leu Thr Val Asn Gly Lys Val Asp Arg Ala Ala Leu Pro Glu
 930 935 940
 Pro Gly Pro Val Ala Thr Gly Asn Ala Asp Arg Glu Pro Thr Thr Glu
 945 950 955 960
 Arg Glu Ser Leu Leu Cys Gly Ala Phe Ala Asp Val Leu Gly Ile Glu
 965 970 975
 Arg Val Gly Val Asp Asp Asp Phe Phe Ser Leu Gly Gly His Ser Leu
 980 985 990
 Leu Ala Thr Ser Leu Val Ser Arg Val Arg Leu Val Leu Gly Glu Glu
 995 1000 1005
 Leu Pro Ile Glu Glu Leu Phe Ala Thr Pro Thr Pro Ala Glu Leu
 1010 1015 1020
 Ala Ala Trp Leu Gln Arg Asn Ala Asp Arg Pro Gln Pro Ala Arg
 1025 1030 1035
 Pro Ala Leu Arg Pro Met His Glu Arg Glu Thr Thr Ala
 1040 1045 1050
 <210> 14
 <211> 6893
 <212> PRT
 <213> Actinoplanes sp.
 <400> 14
 Met Thr Pro Met Ser Tyr Ala Gln Arg Arg Leu Trp Phe Gln Leu Arg
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 Val Glu Gly Pro Asp Ala Thr Tyr Asn Ser Pro Ala Val Leu Arg Leu
 20 25 30
 Thr Gly Glu Leu Asp Thr Ala Ala Leu Glu His Ala Leu Arg Asp Val
 35 40 45
 Leu Glu Arg His Glu Val Leu Arg Thr Val Tyr Pro Asp Val Gly Gly
 50 55 60
 Glu Pro Arg Gln Arg Val Val Arg Pro Asp Asp Met Val Trp Glu Leu
 65 70 75 80
 Pro Thr Thr Arg Val Ser Gly Ala Gly Ala Gly Asp Asp Arg Leu Val
 85 90 95
 Thr Leu Asp Glu Leu Pro Trp Asp Arg Pro Val Leu Asp Leu Pro Ser
 100 105 110
 Pro Ala Pro Ala Gly Arg Glu Pro Asp Gly Glu Ile Thr Val Asp Glu
 115 120 125

Leu Pro Gly Ala Ile Ala Arg Val Ala Ala His Pro Phe Asp Leu Ser
 130 135 140
 Ile Glu Ile Pro Val Arg Ala Arg Leu Phe Ala Leu Gly Pro Arg His
 145 150 155 160
 His Val Leu Val Val Val Leu His His Ile Ala Thr Asp Gly Ser Ser
 165 170 175
 Gly Gly Pro Phe Ala Arg Asp Leu Ala Ala Ala Tyr Arg Ala Arg Arg
 180 185 190
 Thr Gly Thr Ala Pro Gln Trp Ala Pro Leu Pro Val Gln Tyr Ala Asp
 195 200 205
 Tyr Ala Ala Trp Gln Gln Glu Leu Leu Gly Ala Glu Asp Asp Pro Asp
 210 215 220
 Ser Val Ile Ser Arg Gln Leu Ala His Trp Gln Glu Arg Leu Ala Gly
 225 230 235 240
 Met Pro Val Glu Leu Asp Leu Pro Ala Asp Arg Pro Arg Pro Ala Glu
 245 250 255
 Pro Gly His Gly Gly His Thr Lys Ala Leu Ser Leu Pro Pro Ala Val
 260 265 270
 His Arg Gly Leu Ala Thr Leu Ala Arg Arg Arg Arg Ala Thr Leu Gln
 275 280 285
 Met Val Val Gln Thr Gly Val Ala Ile Leu Leu Ser Lys Leu Gly Ala
 290 295 300
 Gly Arg Asp Val Pro Leu Gly Ile Pro Val Ala Gly Arg Thr Asp Ala
 305 310 315 320
 Ala Leu Asp Asp Leu Ile Gly Phe Phe Val Asn Thr Leu Val Val Arg
 325 330 335
 Ala Asp Leu Ser Gly Asp Pro Thr Val Ala Asp Ala Leu Gly Arg Val
 340 345 350
 Arg Gly Gly Ala Val Ala Ala Leu Ala Asp Gln Asp Val Pro Phe Asp
 355 360 365
 Lys Leu Val Glu Arg Leu Ala Pro Ala Arg Val Leu Gly Arg His Pro
 370 375 380
 Leu Phe Gln Val Met Val Ala Pro Leu Asp Asp Gly Thr Pro Ile Asp
 385 390 395 400
 Leu Asp Gly Val Arg Gly Glu Pro Leu Thr Ile Gly Arg Ser Gly Ala
 405 410 415
 Lys Phe Asp Val Glu Val Met Thr Gly Glu Val Arg Ala Ala Asp Gly
 420 425 430
 Ala Pro Ala Gly Ile Arg Gly Ile Leu Thr Leu Ser Ala Asp Leu Phe
 435 440 445
 Asp Glu Ala Thr Ala Gly Arg Met Ala Ala Gly Leu Val Arg Val Leu

Tyr Gly Pro Thr Glu Val Thr Leu Cys Ala Thr Gln His Leu Leu Asp
785 790 795 800
Asp Gly Val Pro Ile Gly Arg Pro Leu Asp Asn Thr Arg Val Tyr Val
805 810 815
Leu Asp Asp Leu Leu Gln Pro Val Pro Val Gly Val Thr Gly Glu Leu
820 825 830
Tyr Val Ala Gly Ala Gly Val Ala Arg Gly Tyr Ala Gly Met Pro Gly
835 840 845
Leu Thr Ala Glu Arg Phe Val Ala Asp Pro Phe Asn Thr Gly Gly Arg
850 855 860
Leu Tyr Arg Thr Gly Asp Leu Val Arg Trp Thr Asp Asp Gly Val Leu
865 870 875 880
His Phe Ala Gly Arg Ala Asp Asp Gln Val Lys Ile Arg Gly Tyr Arg
885 890 895
Val Glu Pro Gly Glu Val Glu Ala Val Leu Ala Gln His Pro Asp Val
900 905 910
Ser Gln Val Ala Val Val Val Arg Glu Asp Thr Pro Gly Asp Lys Arg
915 920 925
Leu Val Ala Tyr Val Val Gly Gly Asp Ile Glu Ala Tyr Gly Gln Glu
930 935 940
Arg Leu Pro Gly Tyr Met Val Pro Ser Ala Phe Val His Leu Asp Ala
945 950 955 960
Leu Pro Leu Thr Ser Asn Gln Lys Val Asp Arg Ala Ala Leu Pro Ala
965 970 975
Pro Ser Met Glu Ser Gly Ala Gly Arg Ala Pro Ala Asp Ala Arg Glu
980 985 990
Glu Leu Val Cys Ala Ala Phe Ala Glu Val Leu Gly Leu Asp Arg Val
995 1000 1005
Gly Val Asp Asp Asp Phe Phe Ala Leu Gly Gly His Ser Leu Leu
1010 1015 1020
Ala Val Ser Leu Val Glu Asp Leu Arg Gln Arg Gly Leu His Val
1025 1030 1035
Ser Val Arg Ala Leu Phe Ala Thr Pro Thr Pro Ala Ala Leu Ala
1040 1045 1050
Val Ser Thr Val Ala Ala Pro Ile Glu Val Pro Pro Asn Leu Ile
1055 1060 1065
Pro Gln Gly Gly Ala Arg Glu Leu Thr Pro Asp Met Leu Pro Leu
1070 1075 1080
Val Asp Leu Thr Gly Glu Glu Leu Ala Thr Ile Val Ala Ala Val
1085 1090 1095

Pro Gly 1100	Gly Ala Ala Asn Ile 1105	Ala Asp Ile Tyr Pro 1110	Leu Ala Pro
Leu Gln 1115	Glu Gly Ile Phe Phe 1120	His His Leu Met Thr 1125	Glu Gly Asp
Thr Ala 1130	Asp Val Tyr Ala Leu 1135	Pro Tyr Leu Leu Arg 1140	Val Gly Thr
Arg Glu 1145	Gln Leu Asp Ala Phe 1150	Leu Gly Ala Leu Gln 1155	Gln Val Val
Asp Arg 1160	His Asp Val Tyr Arg 1165	Thr Ala Ile Ala Trp 1170	Gln Asn Leu
Arg Glu 1175	Pro Val Gln Val Val 1180	His Arg His Ala Thr 1185	Leu Pro Val
Thr Glu 1190	Val Thr Pro Asp Gln 1195	Leu His Ala Ala Ala 1200	Thr Gly Gly
Arg Leu 1205	Pro Leu Asp His Ala 1210	Pro Leu Leu Ser Val 1215	His Ile Ala
Pro Glu 1220	Pro Asp Gly Gly Trp 1225	Leu Ala Leu Leu Arg 1230	Met His His
Leu Val 1235	Gln Asp His Thr Ala 1240	Leu Asp Ile Val Leu 1245	Asp Glu Ile
Arg Thr 1250	Ile Leu Ala Gly Ala 1255	Thr Asp His Leu Pro 1260	Pro Pro Val
Pro Phe 1265	Arg Asn Phe Val Ala 1270	Arg Ser Arg Arg Gly 1275	Ala Ala Glu
Ala Ala 1280	His Arg Asp Tyr Phe 1285	Thr Gly Leu Leu Gly 1290	Asp Val Thr
Glu Thr 1295	Thr Ala Pro Tyr Gly 1300	Leu Thr Asp Val His 1305	Gly Glu His
Ser Gly 1310	Val Arg Arg Gly Arg 1315	Leu Ala Val Ser Ala 1320	Gly Leu Ala
Gly Arg 1325	Val Arg Glu Thr Ala 1330	Arg Asp Arg Gly Val 1335	Ser Pro Ala
Thr Leu 1340	Phe His Leu Ala Trp 1345	Ala Arg Val Leu Ala 1350	Ala Val Ser
Gly Arg 1355	Asp Asp Val Val Phe 1360	Gly Thr Val Leu Leu 1365	Gly Arg Met
Asp Ala 1370	Gly Pro Gly Ala Asp 1375	Arg Val Pro Gly Leu 1380	Phe Met Asn
Thr Leu 1385	Pro Val Arg Val Arg 1390	Leu Gly Gly Arg Thr 1395	Val Asp Glu
Ala Leu	His Gly Met Arg Ala	Gln Leu Ala Asp Leu	Leu Thr His

1400	1405	1410
Glu His Ala Pro Leu Val 1415	Leu Ala Gln Gln Ser 1420	Ala Gly Leu Pro 1425
Gly Gly Ser Pro Leu Phe 1430	Thr Ser Leu Phe Asn 1435	Tyr Arg His Asn 1440
Ala Thr Asp Ile Glu Arg 1445	Ser Gly Thr Gly Ile 1450	Asp Gly Val Glu 1455
Ala Leu Pro Thr Gly Asp 1460	Pro Ser Asn Tyr Pro 1465	Leu Asp Val Ser 1470
Val Asn Gln Ser Pro Leu 1475	Gly Phe Glu Leu Val 1480	Val Glu Ala Thr 1485
Glu Pro Ala Asp Pro Asp 1490	Gln Leu Cys Arg Leu 1495	Leu His Ala Cys 1500
Leu Asp Asp Leu Ile Ala 1505	Ala Leu Asp Glu Gln 1510	Pro Gly Arg Ala 1515
Leu Gly Thr Leu Asp Val 1520	Val Ala Gly Arg Glu 1525	Arg Asp Leu Leu 1530
Leu Asp Gly Trp Asn Ala 1535	Thr Ala Val Pro Ala 1540	Gln Pro Ala Leu 1545
Val Pro Glu Leu Phe Thr 1550	Ala Gln Ala Ala Arg 1555	Thr Pro Thr Trp 1560
Pro Ala Leu Val Thr Ala 1565	Gly Ala Glu Met Ser 1570	Tyr Ala Glu Leu 1575
Glu Glu Arg Ser Asn Arg 1580	Leu Ala Arg Trp Leu 1585	Ala Gly Arg Gly 1590
Val Gly Ala Asp Asp Arg 1595	Val Ala Leu Met Met 1600	Arg Arg Gly Pro 1605
Glu Leu Met Val Ala Ile 1610	Leu Ala Val Leu Lys 1615	Ala Gly Ala Ala 1620
Tyr Leu Pro Val Asp Pro 1625	Asp Leu Pro Arg Asp 1630	Arg Val Asp Tyr 1635
Leu Leu Ala Asp Ala Ala 1640	Pro Ala Phe Val Leu 1645	Ala Glu Arg Ala 1650
Thr Ala Pro Trp Val Pro 1655	Val Ala Gly Gly Ile 1660	Pro Val Leu Val 1665
Val Asp Ala Pro Ala Val 1670	Ala Ala Glu Val Ala 1675	Ala His Ser Gly 1680
Glu Ala Val Thr Asp Arg 1685	Asp Arg Arg Ala Ala 1690	Leu Arg Gly Gly 1695
His Leu Ala Tyr Val Ile 1700	Tyr Thr Ser Gly Ser 1705	Thr Gly Arg Pro 1710

Lys	Gly	Val	Leu	Ile	Thr	His	Asp	Gly	Leu	Ala	Asn	Leu	Thr	Leu
1715						1720					1725			
Asp	His	Gly	Arg	Phe	Gly	Leu	Gly	Pro	Gly	Ala	Arg	Val	Ala	Gln
1730						1735					1740			
Phe	Ala	Ser	Pro	Gly	Phe	Asp	Met	Phe	Val	Asp	Glu	Trp	Ser	Met
1745						1750					1755			
Ala	Leu	Leu	Ala	Gly	Ala	Ala	Leu	Thr	Phe	Val	Pro	Pro	Glu	Arg
1760						1765					1770			
Arg	Leu	Gly	Ala	Asp	Leu	Ala	Ala	Phe	Leu	Ala	Glu	Tyr	Gly	Val
1775						1780					1785			
Thr	His	Ala	Thr	Leu	Pro	Pro	Ala	Val	Val	Gly	Thr	Ile	Pro	Asp
1790						1795					1800			
Gly	Val	Leu	Pro	Pro	Ser	Phe	Val	Leu	Asp	Val	Gly	Gly	Asp	Val
1805						1810					1815			
Leu	Pro	Gly	Asp	Leu	Ala	Arg	Arg	Trp	Leu	Arg	Asp	Gly	Arg	Val
1820						1825					1830			
Leu	Phe	Asn	Ser	Tyr	Gly	Pro	Thr	Glu	Thr	Thr	Val	Asn	Ala	Ala
1835						1840					1845			
Thr	Trp	Arg	Ala	Glu	Ala	Gly	Asp	Trp	Gly	Ser	Val	Ala	Pro	Ile
1850						1855					1860			
Gly	Thr	Pro	Val	Pro	Asn	Leu	Arg	Ala	Tyr	Val	Leu	Asp	Gly	Trp
1865						1870					1875			
Leu	Arg	Pro	Val	Pro	Val	Gly	Ala	Asp	Gly	Glu	Leu	Tyr	Val	Ser
1880						1885					1890			
Gly	Ala	Gly	Leu	Ala	Arg	Gly	Tyr	Leu	Asn	Arg	Ala	Gly	Leu	Thr
1895						1900					1905			
Ala	Glu	Arg	Phe	Val	Ala	Cys	Pro	Phe	Glu	Pro	Gly	Glu	Arg	Met
1910						1915					1920			
Tyr	Arg	Thr	Gly	Asp	Val	Val	Arg	Trp	Thr	Ala	Glu	Gly	Arg	Leu
1925						1930					1935			
Val	Phe	Ala	Gly	Arg	Ser	Asp	Asp	Gln	Val	Lys	Ile	Arg	Gly	Phe
1940						1945					1950			
Arg	Ile	Glu	Pro	Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Ala	Gly	Pro
1955						1960					1965			
Gly	Val	Ser	Gln	Ala	Ala	Val	Ile	Val	Arg	Glu	Asp	Val	Pro	Gly
1970						1975					1980			
Asp	Lys	Arg	Leu	Val	Ala	Tyr	Val	Val	Gly	Gly	Asp	Val	Glu	Ala
1985						1990					1995			
Leu	Arg	Ser	Tyr	Ala	Gln	Gln	Arg	Leu	Pro	Gly	Tyr	Met	Val	Pro
2000						2005					2010			

Ser	Ala	Phe	Val	Glu	Leu	Asp	Arg	Leu	Pro	Leu	Thr	Val	Asn	Gly
2015						2020					2025			
Lys	Leu	Asp	Arg	Arg	Ala	Leu	Pro	Val	Pro	Asp	Leu	Ala	Arg	Gly
2030						2035					2040			
Thr	Gly	Ser	Gly	Arg	Pro	Ala	Gly	Thr	Pro	Arg	Glu	Gln	Leu	Leu
2045						2050					2055			
Cys	Ala	Gly	Phe	Ala	Ala	Val	Leu	Gly	Val	Asp	Asp	Val	Gly	Ala
2060						2065					2070			
Asp	Asp	Asp	Phe	Phe	Ala	Leu	Gly	Gly	His	Ser	Leu	Leu	Val	Val
2075						2080					2085			
Ser	Leu	Val	Glu	Trp	Leu	Arg	Arg	Arg	Gly	Val	Ser	Val	Pro	Val
2090						2095					2100			
Arg	Ala	Leu	Phe	Thr	Thr	Pro	Thr	Pro	Ala	Gly	Leu	Ala	Glu	Ala
2105						2110					2115			
Val	Gly	Asp	Gly	Ala	Val	Val	Val	Pro	Pro	Asn	Leu	Ile	Pro	Glu
2120						2125					2130			
Gly	Ala	Ala	Glu	Leu	Thr	Pro	Glu	Met	Val	Pro	Leu	Ala	Asp	Leu
2135						2140					2145			
Thr	Ser	Glu	Glu	Leu	Ala	Ile	Val	Val	Ala	Ser	Val	Pro	Gly	Gly
2150						2155					2160			
Ala	Ala	Asn	Val	Ala	Asp	Val	Tyr	Pro	Leu	Ala	Pro	Leu	Gln	Glu
2165						2170					2175			
Gly	Ile	Phe	Phe	Pro	Val	Ala	Thr	Gly	Pro	Gln	Cys	Tyr	Ala	Thr
2180						2185					2190			
Val	Gly	Ser	Ser	Leu	Pro	Asp	Asp	Gly	Gly	Ser	Ala	Pro	Cys	Ser
2195						2200					2205			
Arg	Phe	Arg	Arg	Arg	Cys	Val	Ser	Thr	Ser	Val	Val	Trp	Gln	Gly
2210						2215					2220			
Leu	Arg	Glu	Pro	Val	Gln	Val	Val	Trp	Arg	His	Ala	Arg	Leu	Pro
2225						2230					2235			
Val	Glu	Glu	Val	Val	Leu	His	Glu	Gly	Ala	Asp	Pro	Val	Glu	Gln
2240						2245					2250			
Met	Met	Ala	Leu	Ala	Gly	Gly	Trp	Met	Asp	Leu	Thr	Arg	Ala	Pro
2255						2260					2265			
Leu	Ile	Asp	Val	His	Ile	Ala	Ala	Gly	Pro	Gly	Gly	Asp	Arg	Trp
2270						2275					2280			
Leu	Ala	Val	Leu	Arg	Ile	His	His	Leu	Val	Gln	Asp	His	Thr	Ala
2285						2290					2295			
Leu	Glu	Thr	Leu	Leu	Asp	Glu	Leu	Gln	Ser	Phe	Leu	Glu	Gly	Arg
2300						2305					2310			
Gly	Gly	Glu	Leu	Ala	Glu	Pro	Val	Pro	Phe	Arg	Glu	Phe	Val	Ala

2315	2320	2325
Gln Ala Arg Leu Gly Val 2330	Pro Arg Glu Glu His 2335	Glu Arg Tyr Phe 2340
Ala Glu Leu Leu Gly Asp 2345	Ile Thr Glu Thr Thr 2350	Ala Pro Tyr Asp 2355
Leu Thr Asp Val His Gly 2360	Asp Gly Thr Gly Tyr 2365	Asp His Gly Ala 2370
Leu Pro Leu Asp Ala Thr 2375	Val Ala Ala Arg Val 2380	Arg Glu Ala Ala 2385
Arg Thr Leu Gly Val Ser 2390	Pro Ala Thr Leu Phe 2395	His Leu Ala Trp 2400
Ala Arg Val Leu Gly Thr 2405	Leu Ala Gly Arg Asp 2410	Asp Val Val Phe 2415
Gly Thr Val Leu Phe Gly 2420	Arg Met Asn Ser Gly 2425	Ala Gly Ala Asp 2430
Arg Val Ser Gly Leu Phe 2435	Ile Asn Thr Leu Pro 2440	Val Arg Val Arg 2445
Leu Gly Ala Pro Thr Gly 2450	Asp Ala Leu Gly Asp 2455	Leu Arg Asp Gln 2460
Leu Ala Glu Leu Leu Val 2465	His Glu His Ala Ser 2470	Leu Ala Ser Ala 2475
Gln Lys Ala Ser Gly Leu 2480	Pro Gly Gly Ser Pro 2485	Leu Phe Thr Ser 2490
Ile Phe Asn Tyr Arg His 2495	Asn Gln Val Ser Ala 2500	Glu Arg Glu Thr 2505
Ala Ala Leu Pro Gly Ile 2510	Arg Val Leu Ala Ala 2515	Arg Asp Ser Thr 2520
Asn Tyr Pro Leu Thr Val 2525	Ala Val Asp Asp Asp 2530	Gly His Gly Phe 2535
Thr Leu Val Val Glu Val 2540	Ala Ser Thr Val Asp 2545	Ala Ala Gly Val 2550
Cys Glu Leu Leu His Thr 2555	Ala Val Asp Asn Leu 2560	Ile Ala Ala Leu 2565
Thr Asp Arg Pro Gly Gly 2570	Pro Leu Ala Glu Val 2575	Asp Ile Leu Glu 2580
Arg Gly Leu Arg Asp Arg 2585	Leu Leu Thr Ala Trp 2590	Asn Glu Ala Arg 2595
Glu Pro Ala Pro Pro Val 2600	Thr Leu Pro Asp Leu 2605	Phe Asp Arg Gln 2610
Ala Arg Arg Thr Pro Glu 2615	Ala Val Ala Leu Thr 2620	Ala Asp Gly Val 2625

Ser	Leu	Thr	Tyr	Arg	Glu	Leu	Ser	Glu	Arg	Ala	Asn	Arg	Ile	Ala
2630						2635					2640			
Arg	Leu	Leu	Thr	Ser	Arg	Gly	Ile	Gly	Pro	Glu	Ser	Leu	Val	Gly
2645						2650					2655			
Val	Val	Leu	Pro	Arg	Ser	Ala	Asp	Leu	Val	Val	Ala	Leu	Leu	Gly
2660						2665					2670			
Val	Leu	Gln	Ala	Gly	Ala	Ala	Tyr	Val	Pro	Val	Asp	Ala	Asp	Tyr
2675						2680					2685			
Pro	Ala	Glu	Arg	Ile	Gly	Tyr	Ile	Leu	Gly	Asp	Ala	Gly	Ala	Val
2690						2695					2700			
Cys	Val	Leu	Thr	Val	Asp	Ala	Thr	Ala	Gly	Ala	Val	Pro	Pro	Gly
2705						2710					2715			
Val	Pro	Lys	Leu	Val	Leu	Asp	His	Pro	Glu	Thr	Val	Thr	Ala	Leu
2720						2725					2730			
Ala	Ala	Cys	Asp	Thr	Ala	Pro	Leu	Gly	Glu	Ala	Glu	Arg	Ala	Gly
2735						2740					2745			
Glu	Leu	Leu	Pro	Glu	His	Pro	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly
2750						2755					2760			
Ser	Thr	Gly	Thr	Pro	Lys	Gly	Val	Leu	Ile	Pro	His	Arg	Asn	Val
2765						2770					2775			
Val	Glu	Leu	Phe	Ala	Ala	Thr	Arg	Gly	Ser	Phe	His	Phe	Gly	Glu
2780						2785					2790			
Gly	Asp	Val	Trp	Ser	Trp	Phe	His	Ser	Val	Ala	Phe	Asp	Phe	Ser
2795						2800					2805			
Val	Trp	Glu	Leu	Trp	Gly	Ala	Leu	Leu	His	Gly	Gly	Arg	Val	Val
2810						2815					2820			
Met	Val	Pro	Phe	Ala	Val	Ser	Arg	Ser	Pro	Arg	Asp	Phe	Trp	Glu
2825						2830					2835			
Leu	Leu	Val	Arg	Glu	Arg	Val	Thr	Val	Leu	Ser	Gln	Thr	Pro	Ser
2840						2845					2850			
Ala	Phe	Tyr	Gln	Leu	Ala	Ala	Ala	Ala	Asp	Asp	Thr	Pro	Asp	Ala
2855						2860					2865			
Leu	Arg	Val	Val	Val	Phe	Gly	Gly	Glu	Ala	Leu	Asp	Pro	Gly	Arg
2870						2875					2880			
Leu	Ala	Gly	Trp	Arg	Glu	Arg	Arg	Pro	Asp	Gly	Pro	Arg	Leu	Val
2885						2890					2895			
Asn	Met	Tyr	Gly	Ile	Thr	Glu	Thr	Thr	Val	His	Val	Thr	His	Gln
2900						2905					2910			
Asp	Leu	Ala	Pro	Ala	Asp	Thr	Thr	Gly	Ser	Pro	Ile	Gly	Arg	Gly
2915						2920					2925			

Ile	Pro	Gly	Leu	Ser	Val	Tyr	Val	Leu	Asp	Glu	Ala	Leu	Arg	Pro
2930						2935					2940			
Val	Pro	Pro	Gly	Val	Ala	Gly	Glu	Val	Tyr	Val	Ala	Gly	Arg	Gln
2945						2950					2955			
Leu	Ala	Arg	Ala	Tyr	Leu	Gly	Arg	Ala	Ala	Leu	Thr	Gly	Thr	Arg
2960						2965					2970			
Phe	Val	Ala	Cys	Pro	Phe	Leu	Pro	Ala	Gly	Glu	Arg	Met	Tyr	Arg
2975						2980					2985			
Thr	Gly	Asp	Arg	Ala	Arg	Trp	Ser	Arg	Gly	Arg	Leu	Gln	Phe	Ala
2990						2995					3000			
Gly	Arg	Thr	Asp	Asp	Gln	Val	Gln	Ile	Arg	Gly	Phe	Arg	Ile	Glu
3005						3010					3015			
Pro	Gly	Glu	Val	Gln	Ala	Val	Val	Ala	Ala	His	Pro	Glu	Ile	Ala
3020						3025					3030			
Ala	Ala	Ala	Val	Val	Val	Arg	Glu	Asp	Val	Pro	Gly	Asp	Pro	Arg
3035						3040					3045			
Leu	Thr	Ala	Tyr	Val	Val	Pro	Ala	Gly	Pro	Arg	Thr	Ala	Pro	Ala
3050						3055					3060			
Ala	Val	Ala	Glu	Thr	Val	Arg	Arg	Phe	Ala	Ala	Asp	Arg	Leu	Pro
3065						3070					3075			
Ala	Tyr	Met	Leu	Pro	Ser	Ala	Val	Val	Val	Leu	Asp	Ala	Leu	Pro
3080						3085					3090			
Leu	Thr	Asp	His	Gly	Lys	Leu	Asp	Arg	Arg	Ala	Leu	Pro	Ala	Pro
3095						3100					3105			
Gln	His	Thr	Gly	Ala	Ala	Ser	Gly	Arg	Ala	Pro	Ala	Thr	Val	Ala
3110						3115					3120			
Glu	Glu	Val	Leu	Cys	Ala	Ala	Phe	Ala	Glu	Val	Leu	Gly	Val	Glu
3125						3130					3135			
Arg	Val	Gly	Val	Asp	Asp	Asp	Phe	Phe	Ala	Leu	Gly	Gly	His	Ser
3140						3145					3150			
Leu	Leu	Ile	Val	Ser	Leu	Val	Glu	Arg	Val	Arg	Arg	Ala	Gly	Leu
3155						3160					3165			
Ala	Ile	Pro	Val	Arg	Ala	Leu	Phe	Arg	Ser	Ala	Thr	Pro	Ala	Gly
3170						3175					3180			
Leu	Ala	Ala	Leu	Ala	Arg	Pro	Tyr	Arg	Val	Asp	Ile	Pro	Pro	Asn
3185						3190					3195			
Leu	Val	Pro	Asp	Gly	Ala	Arg	Glu	Ile	Thr	Pro	Asp	Met	Leu	Thr
3200						3205					3210			
Leu	Ala	Ala	Leu	Thr	Glu	Ala	Glu	Ile	Ala	Thr	Val	Leu	Ala	Thr
3215						3220					3225			
Val	Pro	Gly	Gly	Ala	Val	Asn	Val	Ala	Asp	Ile	Tyr	Pro	Leu	Ala

3230					3235					3240				
Pro	Leu	Gln	Glu	Gly	Ile	Phe	Phe	His	His	Leu	Met	Ala	Asp	Ala
3245						3250					3255			
Gly	Arg	Ala	Asp	Ala	Tyr	Ala	Met	Pro	Tyr	Val	Leu	His	Leu	Asp
3260						3265					3270			
Thr	Ala	Glu	Arg	Leu	Asp	Val	Leu	Leu	Gly	Ala	Leu	Gln	Arg	Val
3275						3280					3285			
Ile	Asp	Arg	Asn	Asp	Ile	Tyr	Arg	Thr	Gly	Val	Val	Ser	Ala	Gly
3290						3295					3300			
Leu	Arg	Glu	Pro	Val	Gln	Val	Val	Trp	Arg	Ser	Ala	Val	Leu	Pro
3305						3310					3315			
Val	Glu	Glu	Val	Ala	Leu	Asp	Gly	Gly	His	Asp	Pro	Val	Glu	Gln
3320						3325					3330			
Leu	Leu	Ala	Ala	Ala	Gly	Glu	Glu	Phe	Asp	Leu	Thr	Arg	Ala	Pro
3335						3340					3345			
Leu	Ile	Arg	Ala	His	Val	Ala	Ala	His	Pro	Asp	Gly	Gly	Arg	Leu
3350						3355					3360			
Leu	Leu	Leu	Arg	Ile	His	His	Leu	Val	Gln	Asp	His	Thr	Thr	Phe
3365						3370					3375			
Asp	Val	Val	Leu	Gly	Glu	Leu	Arg	Ala	Phe	Leu	Glu	Gly	Arg	Gly
3380						3385					3390			
Gly	Glu	Leu	Ala	Glu	Pro	Val	Pro	Phe	Arg	Glu	Phe	Val	Ala	Gln
3395						3400					3405			
Ala	Arg	Leu	Gly	Val	Pro	Arg	Glu	Glu	His	Glu	Arg	Tyr	Phe	Ala
3410						3415					3420			
Glu	Leu	Leu	Gly	Asp	Val	Thr	Glu	Thr	Thr	Ala	Pro	Tyr	Gly	Leu
3425						3430					3435			
Thr	Asp	Val	His	Gly	Asp	Gly	Ser	Arg	Ala	Val	Gln	Val	Ser	Leu
3440						3445					3450			
Pro	Val	Ala	Glu	Ala	Leu	Ala	Val	Arg	Val	Arg	Glu	Val	Ala	Arg
3455						3460					3465			
Thr	Leu	Gly	Val	Ser	Pro	Ala	Thr	Val	Phe	His	Leu	Ala	Trp	Ala
3470						3475					3480			
Arg	Val	Leu	Ser	Val	Ile	Ala	Gly	Arg	Asp	Asp	Val	Val	Phe	Gly
3485						3490					3495			
Thr	Ile	Leu	Phe	Gly	Arg	Met	Asn	Ser	Gly	Ala	Ala	Ala	Glu	Arg
3500						3505					3510			
Val	Pro	Gly	Leu	Phe	Ile	Asn	Thr	Leu	Pro	Val	Arg	Val	Arg	Leu
3515						3520					3525			
Asn	Gly	Thr	Ser	Val	Gly	Glu	Ala	Leu	Thr	Ala	Leu	Arg	Asp	Gln
3530						3535					3540			

Met	Ala	Glu	Leu	Met	Ala	His	Glu	His	Ala	Pro	Leu	Ala	Leu	Ala
3545						3550					3555			
Gln	Arg	Ala	Gly	Gly	Val	Pro	Ala	Gly	Ser	Pro	Leu	Phe	Thr	Ser
3560						3565					3570			
Leu	Phe	Asn	Tyr	Arg	His	Asn	Val	Ala	Gly	Gly	Gly	Asp	Gly	Gly
3575						3580					3585			
Ala	Leu	Glu	Gly	Val	Thr	Pro	Val	Leu	His	Arg	Asp	Thr	Thr	Asn
3590						3595					3600			
Tyr	Pro	Val	Val	Val	Ser	Val	Asp	Asp	Asp	Gly	Thr	Ser	Phe	Asp
3605						3610					3615			
Leu	Val	Val	Glu	Ala	Val	Ala	Pro	Ala	Glu	Ala	Gly	Arg	Val	Gly
3620						3625					3630			
Arg	Leu	Met	His	Glu	Cys	Leu	Ala	Glu	Leu	Val	Gly	Ala	Leu	Ala
3635						3640					3645			
Gly	Ala	Pro	Glu	Thr	Pro	Leu	Ser	Arg	Val	Arg	Val	Ile	Asp	Glu
3650						3655					3660			
Ala	Glu	Ile	Glu	Arg	Val	Val	His	Ser	Trp	Asn	Asp	Thr	Ala	Arg
3665						3670					3675			
Pro	Val	Val	Glu	Ser	Ser	Val	Pro	Ala	Leu	Phe	Ala	Glu	Gln	Val
3680						3685					3690			
Ala	Ala	Ala	Pro	Asp	Ala	Thr	Ala	Val	Val	Gly	Glu	Gly	Val	Ser
3695						3700					3705			
Trp	Ser	Tyr	Arg	Glu	Leu	Asp	Ala	Arg	Ser	Asp	Ala	Leu	Ala	Arg
3710						3715					3720			
Ser	Leu	Val	Ala	Ala	Gly	Val	Gly	Val	Glu	Ser	Pro	Val	Val	Val
3725						3730					3735			
Ala	Leu	Glu	Arg	Ser	Pro	Glu	Val	Leu	Ser	Ala	Phe	Leu	Ala	Val
3740						3745					3750			
Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp	Pro
3755						3760					3765			
Gln	Ala	Arg	Ile	Asp	Ala	Val	Val	Ala	Asp	Cys	Ala	Ala	Arg	Val
3770						3775					3780			
Ala	Val	Ala	Asp	Arg	Pro	Met	Ser	Gly	Leu	Thr	Val	Val	Pro	Ala
3785						3790					3795			
Asp	Gln	Val	Gly	Asp	Ser	Ala	Val	Val	Leu	Pro	Ala	Gly	Pro	Val
3800						3805					3810			
Pro	Gly	Ala	Ala	Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr	Gly
3815						3820					3825			
Arg	Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp	Leu
3830						3835					3840			

Ala	Thr	Asp	Thr	Cys	Trp	Gly	Pro	Thr	Pro	Arg	Val	Leu	Phe	His
3845						3850					3855			
Ala	Pro	His	Ala	Phe	Asp	Ala	Ser	Ser	Tyr	Glu	Ile	Trp	Val	Pro
3860						3865					3870			
Leu	Leu	Asn	Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Gln	Arg	Ser	Ile
3875						3880					3885			
Asp	Ala	Thr	Val	Leu	Arg	Asp	Leu	Ile	Arg	Gly	His	Glu	Leu	Thr
3890						3895					3900			
His	Val	His	Val	Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Asp	Pro	Ser
3905						3910					3915			
Cys	Phe	Ala	Gly	Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly	Asp	Ala	Val
3920						3925					3930			
Ser	Ala	Glu	Ala	Val	Arg	Arg	Val	Arg	Glu	Ala	Asn	Pro	Gly	Leu
3935						3940					3945			
Arg	Val	Arg	Gln	Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr	Leu	Cys	Ala
3950						3955					3960			
Thr	Gln	His	Leu	Leu	Val	Asp	Gly	Val	Pro	Ile	Gly	Arg	Pro	Leu
3965						3970					3975			
Asp	Asn	Thr	Arg	Val	Tyr	Val	Leu	Asp	Asp	Leu	Leu	Gln	Pro	Val
3980						3985					3990			
Pro	Val	Gly	Val	Thr	Gly	Glu	Leu	Tyr	Val	Ala	Gly	Ala	Gly	Leu
3995						4000					4005			
Ala	Arg	Gly	Tyr	Ala	Gly	Met	Pro	Gly	Leu	Thr	Ala	Glu	Arg	Phe
4010						4015					4020			
Val	Ala	Asp	Pro	Phe	Ser	Val	Gly	Gly	Arg	Leu	Tyr	Arg	Thr	Gly
4025						4030					4035			
Asp	Leu	Val	Arg	Trp	Thr	Asp	Asp	Gly	Val	Leu	His	Phe	Ala	Gly
4040						4045					4050			
Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg	Gly	Tyr	Arg	Val	Glu	Pro
4055						4060					4065			
Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Gln	His	Pro	Asp	Val	Ser	Gln
4070						4075					4080			
Val	Ala	Val	Val	Val	Arg	Glu	Asp	Thr	Pro	Gly	Asp	Lys	Arg	Leu
4085						4090					4095			
Val	Ala	Tyr	Val	Val	Gly	Gly	Asp	Val	Glu	Ala	Tyr	Ala	Gln	Glu
4100						4105					4110			
Arg	Leu	Pro	Gly	Tyr	Leu	Val	Pro	Ser	Ala	Phe	Val	His	Leu	Asp
4115						4120					4125			
Ala	Leu	Pro	Leu	Thr	Ser	Asn	Gln	Lys	Val	Asp	Arg	Ala	Ala	Leu
4130						4135					4140			
Pro	Ala	Pro	Ser	Val	Glu	Ser	Gly	Val	Gly	Arg	Ala	Pro	Ala	Asp

4145	4150	4155
Ala Arg Glu Glu Leu Met Cys	Ala Ala Phe Ala Glu Val Leu Asp	
4160	4165	4170
Leu Asp Arg Val Gly Val Asp	Asp Asp Phe Phe Ala Leu Gly Gly	
4175	4180	4185
His Ser Leu Leu Val Val Arg	Leu Val Gly Arg Ile Arg Gln Val	
4190	4195	4200
Phe Gly Val Glu Val Ser Ala	Arg Leu Val Phe Asp Ala Arg Thr	
4205	4210	4215
Pro Ala Gly Val Val Ala Arg	Leu Ser Glu Gly Gly Thr Ala Arg	
4220	4225	4230
Glu Ala Val Arg Ala Arg Val	Arg Pro Ala Arg Val Pro Leu Ser	
4235	4240	4245
Phe Ala Gln Arg Arg Leu Trp	Phe Leu Ser Gln Leu Glu Gly Pro	
4250	4255	4260
Ser Ala Thr Tyr Asn Ile Pro	Val Ala Leu Arg Leu Asp Gly Pro	
4265	4270	4275
Leu Asp Arg Asp Ala Leu Thr	Ala Ala Leu His Asp Val Val Ala	
4280	4285	4290
Arg His Glu Val Leu Arg Thr	Val Phe Thr Val Ala Asp Gly Glu	
4295	4300	4305
Pro Trp Gln Gln Ile Leu Asp	Asp Pro Gln Val Ser Val Pro Val	
4310	4315	4320
Val Glu Val Thr Pro Asp Arg	Leu Pro Glu Ala Val Ala Val Ala	
4325	4330	4335
Ala Gly His Arg Phe Asp Leu	Gly Arg Glu Leu Pro Leu Arg Ala	
4340	4345	4350
Val Leu Leu Ala Thr Gly Asp	Asp Val His Val Leu Val Leu Val	
4355	4360	4365
Val His His Ile Ala Ala Asp	Gly Trp Ser Met Arg Pro Leu Ala	
4370	4375	4380
Arg Asp Leu Ala Ala Ala Tyr	Ala Ala Arg Ile Asp Ala Thr Ala	
4385	4390	4395
Pro Ala Leu Gly Ala Leu Pro	Val Gln Tyr Ala Asp Tyr Ala Leu	
4400	4405	4410
Trp Gln Arg Asp Val Leu Gly	Ser Glu His Asp Pro Asp Ser Val	
4415	4420	4425
Ile Ser Gln Gln Val Ala Tyr	Trp Arg Arg Gln Leu Ala Gly Val	
4430	4435	4440
Pro Glu Glu Leu Asp Leu Pro	Val Asp Arg Ala Arg Pro Ala Glu	
4445	4450	4455

Ala Ser His Arg Gly His Thr Val Glu Phe Ala Val Pro Pro Ala	4460	4465	4470
Val His His Gln Leu Ala Glu Leu Ala Arg Arg Asn Gly Val Thr	4475	4480	4485
Val Phe Met Thr Val Gln Thr Ala Leu Ala Val Leu Leu Ser Lys	4490	4495	4500
Leu Gly Ala Gly Thr Asp Ile Pro Ile Gly Val Ala Val Ala Gly	4505	4510	4515
Arg Thr Asp Pro Thr Leu Asp Asn Leu Ile Gly Phe Phe Val Asn	4520	4525	4530
Thr Leu Val Leu Arg Thr Asp Leu Thr Gly Asn Pro Thr Ile Thr	4535	4540	4545
Asp Leu Leu His Arg Thr Arg Asp Thr Thr Leu His Ala Phe Thr	4550	4555	4560
His Gln Asp Val Pro Phe Glu Lys Leu Val Glu Asp Leu Ala Pro	4565	4570	4575
Thr Arg Ser Leu Ala Arg His Pro Leu Phe Gln Val Met Met Thr	4580	4585	4590
Leu Gln Ser Ala Ser Ala Asp Glu Glu Pro Leu Ala Leu Ala Gly	4595	4600	4605
Leu Arg Val Thr Asp Leu Pro Ala Gly Glu Thr Pro Ala Lys Val	4610	4615	4620
Asp Leu Asp Leu Thr Leu His Glu Val Ala Gly Arg Asp Gly Met	4625	4630	4635
His Ala Thr Leu Leu Gly Ala Ala Asp Leu Phe Glu Gln Glu Thr	4640	4645	4650
Val Arg Ala Leu Ala Asp Arg Leu Leu Arg Thr Leu Glu Ala Met	4655	4660	4665
Ala Ala Ala Pro Asp Asp Arg Leu Asp Arg Ile Glu Val Leu Ser	4670	4675	4680
Pro Gly Glu Arg Ser Arg Leu Leu Val Glu Trp Asn Asp Thr Ala	4685	4690	4695
Arg Pro Val Val Glu Ser Ser Val Pro Ala Leu Phe Ala Glu Gln	4700	4705	4710
Val Ala Ala Ala Pro Asp Ala Val Ala Val Val Gly Glu Gly Val	4715	4720	4725
Ser Trp Thr Tyr Arg Glu Leu Asp Ala Arg Ser Asp Ala Leu Ala	4730	4735	4740
Arg Ser Leu Val Ala Ala Gly Val Gly Val Glu Ser Pro Val Val	4745	4750	4755

Val	Ala	Leu	Glu	Arg	Ser	Pro	Glu	Val	Leu	Ser	Ala	Phe	Leu	Ala
4760						4765					4770			
Val	Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp
4775						4780					4785			
Pro	Gln	Ala	Arg	Val	Asp	Ala	Val	Val	Ala	Asp	Cys	Gly	Ala	Arg
4790						4795					4800			
Ile	Ala	Val	Ala	Asp	Arg	Pro	Met	Ser	Gly	Leu	Thr	Val	Val	Ser
4805						4810					4815			
Ala	Gly	Leu	Gly	Gly	Asp	Ser	Ala	Val	Val	Ser	Gly	Asp	Leu	Thr
4820						4825					4830			
Ala	Asp	Arg	Ala	Val	Val	Leu	Pro	Ala	Gly	Pro	Val	Pro	Gly	Ala
4835						4840					4845			
Ala	Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro	Lys
4850						4855					4860			
Gly	Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp	Leu	Ala	Thr	Asp
4865						4870					4875			
Thr	Cys	Trp	Gly	Pro	Thr	Pro	Arg	Val	Leu	Phe	His	Ala	Pro	His
4880						4885					4890			
Ala	Phe	Asp	Ala	Ser	Ser	Tyr	Glu	Ile	Trp	Val	Pro	Leu	Leu	Asn
4895						4900					4905			
Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Arg	Arg	Ser	Ile	Asp	Ala	Thr
4910						4915					4920			
Val	Leu	Arg	Asp	Leu	Ile	Gly	Ala	His	Glu	Leu	Thr	His	Val	His
4925						4930					4935			
Val	Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Asp	Pro	Ser	Cys	Phe	Ala
4940						4945					4950			
Gly	Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly	Asp	Ala	Val	Ser	Ala	Glu
4955						4960					4965			
Ala	Val	Arg	Arg	Val	Lys	Asp	Ala	Asn	Pro	Gly	Leu	Arg	Val	Arg
4970						4975					4980			
Gln	Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr	Leu	Cys	Ala	Thr	Gln	His
4985						4990					4995			
Leu	Leu	Asp	Asp	Gly	Val	Pro	Ile	Gly	Arg	Pro	Leu	Asp	Asn	Thr
5000						5005					5010			
Arg	Val	Tyr	Val	Leu	Asp	Asp	Leu	Leu	Arg	Pro	Val	Pro	Thr	Gly
5015						5020					5025			
Val	Val	Gly	Glu	Leu	Tyr	Val	Ala	Gly	Ser	Gly	Leu	Ala	Arg	Gly
5030						5035					5040			
Tyr	Ala	Gly	Met	Pro	Gly	Leu	Thr	Ala	Glu	Arg	Phe	Val	Ala	Asp
5045						5050					5055			
Pro	Phe	Asn	Thr	Gly	Gly	Arg	Leu	Tyr	Arg	Thr	Gly	Asp	Leu	Val

5060	5065	5070
Arg Trp Ala Asp Asp Gly Val 5075	Leu His Phe Ala Gly 5080	Arg Ala Asp 5085
Asp Gln Val Lys Ile Arg Gly 5090	Tyr Arg Val Glu 5095	Gly Glu Val 5100
Glu Ala Val Leu Ala Gln His 5105	Pro Asp Val Ser 5110	Gln Val Ala Val 5115
Val Val Arg Glu Asp Thr Pro 5120	Gly Asp Lys Arg 5125	Leu Val Ala Tyr 5130
Val Val Gly Gly Asp Val Glu 5135	Ala Tyr Ala Gln 5140	Glu Arg Leu Pro 5145
Gly Tyr Met Val Pro Ser Ala 5150	Phe Val Gln Leu 5155	Asp Ala Leu Pro 5160
Leu Thr Ser Asn Gln Lys Val 5165	Asp Arg Ala Ala 5170	Leu Pro Ala Pro 5175
Ser Met Glu Ser Gly Ala Gly 5180	Arg Ala Pro Ala 5185	Asp Ala Arg Glu 5190
Glu Leu Met Cys Ala Ala Phe 5195	Ala Glu Val Leu 5200	Asp Leu Asp Arg 5205
Val Gly Val Asp Asp Asp Phe 5210	Phe Ala Leu Gly 5215	Gly His Ser Leu 5220
Leu Ala Val Ser Leu Val Glu 5225	Asn Leu Arg Arg 5230	His Gly Val His 5235
Ile Ser Val Arg Ala Leu Phe 5240	Ala Thr Pro Thr 5245	Pro Ala Ala Leu 5250
Ala Ala Ser Ala Gly Thr Ala 5255	Val Pro Asp Val 5260	Pro Pro Asn Leu 5265
Ile Pro Gln Gly Gly Ala Gln 5270	Glu Leu Thr Pro 5275	Asp Met Leu Pro 5280
Leu Val Asp Leu Thr Gly Glu 5285	Glu Leu Ala Thr 5290	Ile Val Ala Ala 5295
Val Pro Gly Gly Ala Pro Asn 5300	Ile Ala Asp Ile 5305	Tyr Pro Leu Ala 5310
Pro Leu Gln Glu Gly Ile Phe 5315	Phe His His Leu 5320	Met Thr Glu Gly 5325
Asp Ala Thr Asp Val Tyr Leu 5330	Leu Pro Arg Ile 5335	Leu Gly Phe Gly 5340
Gly Arg Pro Glu Leu Asp Ala 5345	Phe Leu Gly Ala 5350	Leu Gln Gln Val 5355
Val Asp Arg His Asp Val Tyr 5360	Arg Thr Ala Ile 5365	Ala Trp Gln Asn 5370

Leu	Arg	Glu	Pro	Val	Gln	Val	Val	His	Arg	His	Ala	Thr	Leu	Pro
5375						5380					5385			
Val	Thr	Glu	Val	Thr	Pro	Asp	Gln	Leu	His	Ala	Ala	Ala	Thr	Gly
5390						5395					5400			
Gly	Arg	Leu	Pro	Leu	Asp	His	Ala	Pro	Leu	Leu	Ser	Val	His	Ile
5405						5410					5415			
Ala	Pro	Glu	Pro	Asp	Gly	Gly	Trp	Leu	Ala	Leu	Leu	Arg	Met	His
5420						5425					5430			
His	Leu	Val	Gln	Asp	His	Thr	Ala	Leu	Asp	Ile	Val	Leu	Asp	Glu
5435						5440					5445			
Ile	Arg	Thr	Ile	Leu	Ala	Gly	Ala	Thr	Asp	His	Leu	Pro	Pro	Pro
5450						5455					5460			
Val	Pro	Phe	Arg	Asp	Phe	Val	Ala	Gln	Ala	Arg	Leu	Gly	Val	Ser
5465						5470					5475			
Arg	Ala	Glu	Gln	Glu	Arg	Tyr	Phe	Ala	Gly	Leu	Leu	Gly	Asp	Val
5480						5485					5490			
Thr	Glu	Thr	Thr	Ala	Pro	Tyr	Gly	Leu	Ala	Asp	Val	Thr	Asn	Asp
5495						5500					5505			
Gly	Thr	Ala	Ser	Val	Arg	Ala	Glu	Val	Glu	Leu	Asp	Ala	Ala	Leu
5510						5515					5520			
Ala	Ala	Arg	Leu	Arg	Asp	Leu	Ala	Arg	Asp	Arg	Gly	Val	Ser	Pro
5525						5530					5535			
Ala	Thr	Val	Phe	His	Leu	Ala	Trp	Ala	Arg	Val	Leu	Ala	Ala	Val
5540						5545					5550			
Ala	Asp	Arg	Glu	Asp	Val	Val	Phe	Gly	Thr	Val	Leu	Phe	Gly	Arg
5555						5560					5565			
Met	Ala	Ser	Gly	Ala	Arg	Arg	Val	Pro	Gly	Leu	Phe	Met	Asn	Thr
5570						5575					5580			
Leu	Pro	Val	Arg	Val	Arg	Leu	Ser	Gly	Thr	Ala	Ala	Glu	Ala	Leu
5585						5590					5595			
Gly	Gln	Val	Arg	Asp	Arg	Leu	Ala	Glu	Leu	Met	Ala	His	Glu	His
5600						5605					5610			
Ala	Pro	Leu	Ala	Leu	Ala	Gln	Gln	Ala	Ser	Gly	Leu	Pro	Ala	Gly
5615						5620					5625			
Ser	Pro	Leu	Phe	Thr	Ser	Leu	Phe	Asn	Tyr	Arg	Tyr	Ala	Arg	Pro
5630						5635					5640			
Pro	Ala	Ala	Thr	Pro	Asp	Asp	Pro	Leu	Ala	Gly	Val	Arg	Thr	Leu
5645						5650					5655			
Phe	Ala	Trp	Glu	Arg	Asn	Asn	Tyr	Pro	Val	Thr	Val	Ser	Ile	Asp
5660						5665					5670			

Asp	Asp	Gly	Thr	Gly	Phe	Ala	Val	Thr	Val	Asp	Val	Val	Ala	Pro
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Ala	Asp	Ala	Asp	Glu	Val	Val	Arg	Leu	Leu	Arg	Thr	Thr	Leu	Thr
5690						5695					5700			
Arg	Leu	Ala	Ala	Ala	Leu	Glu	Arg	Thr	Pro	Glu	Met	Pro	Val	Ala
5705						5710					5715			
Asp	Val	Arg	Pro	Gly	Arg	Val	Ser	Arg	Pro	Ala	Ala	Gly	Arg	Ala
5720						5725					5730			
Val	Leu	Val	Pro	Val	Pro	Ala	Gly	Glu	Arg	Ala	Thr	Gly	Ala	Gly
5735						5740					5745			
Arg	Ala	Pro	Ala	Thr	Ala	Tyr	Glu	Glu	Leu	Ile	Cys	Gln	Ala	Tyr
5750						5755					5760			
Ala	Gln	Val	Leu	Glu	Val	Asp	Arg	Val	Ala	Ala	Asp	Asp	Asp	Phe
5765						5770					5775			
Phe	Ala	Leu	Gly	Gly	Asn	Ser	Leu	Leu	Ala	Thr	Arg	Leu	Val	Ser
5780						5785					5790			
Arg	Ile	Arg	Ser	Ala	Leu	Gly	Val	Glu	Val	Thr	Ile	Arg	Ala	Leu
5795						5800					5805			
Phe	Glu	Thr	Leu	Thr	Pro	Gln	Arg	Leu	Ala	Ala	Arg	Leu	Thr	Arg
5810						5815					5820			
Ala	Ser	Ala	Pro	Gly	Arg	Val	Ala	Pro	Ala	Pro	Arg	Thr	Arg	Pro
5825						5830					5835			
Glu	Arg	Ile	Pro	Leu	Ser	Phe	Ala	Gln	Arg	Arg	Leu	Trp	Phe	Leu
5840						5845					5850			
Gly	Glu	Leu	Glu	Gly	Ser	Ser	Ala	Thr	Tyr	Ser	Asn	Thr	Thr	Ala
5855						5860					5865			
Leu	Arg	Leu	Ser	Gly	Glu	Leu	Asp	Pro	Ala	Ala	Leu	Thr	Ala	Ala
5870						5875					5880			
Leu	His	Asp	Val	Ile	Gly	Arg	His	Glu	Val	Leu	Arg	Thr	Val	Ile
5885						5890					5895			
Pro	Ala	Glu	Asp	Gly	Arg	Pro	Tyr	Gln	Leu	Val	Leu	Pro	Pro	Glu
5900						5905					5910			
Glu	Ala	Arg	Pro	Ala	Val	Glu	Ile	Val	Glu	Val	Ala	Pro	Gly	Glu
5915						5920					5925			
Leu	Gly	Ala	Ala	Val	Asp	Glu	Val	Ala	Gly	Tyr	Ala	Phe	Asp	Leu
5930						5935					5940			
Ala	Ala	Glu	Ile	Pro	Val	Arg	Ala	Arg	Leu	Ile	Arg	Leu	Gly	Ala
5945						5950					5955			
Thr	Asp	His	Val	Leu	Val	Leu	Val	Ile	His	His	Ile	Ala	Thr	Asp
5960						5965					5970			
Gly	Trp	Ser	Met	Ala	Pro	Leu	Ala	Arg	Asp	Leu	Ala	Ala	Ala	Tyr

5975					5980					5985				
Glu	Ala	Arg	Leu	Ala	Gly	Arg	Ala	Pro	Arg	Trp	Glu	Pro	Leu	Pro
5990						5995					6000			
Leu	Gln	Tyr	Ala	Asp	Tyr	Ala	Leu	Trp	Gln	Glu	Glu	Leu	Leu	Gly
6005						6010					6015			
Ala	Ala	Gly	Asp	Pro	Glu	Ser	Leu	Arg	Glu	Arg	Gln	Leu	Ala	Tyr
6020						6025					6030			
Trp	Arg	Asp	Thr	Leu	Ala	Gly	Met	Pro	Pro	Glu	Ile	Pro	Leu	Pro
6035						6040					6045			
Ala	Asp	Arg	Ser	Arg	Pro	Pro	Val	Ala	Ser	His	Arg	Gly	Gly	Glu
6050						6055					6060			
Val	Pro	Ile	Ala	Ile	Pro	Ala	Asp	Leu	His	Arg	Arg	Leu	Ala	Glu
6065						6070					6075			
Leu	Ala	Val	Ala	Glu	Arg	Ala	Thr	Leu	Phe	Met	Val	Leu	Gln	Ala
6080						6085					6090			
Gly	Phe	Ala	Ala	Leu	Leu	Ser	Arg	Leu	Gly	Ala	Gly	Thr	Asp	Val
6095						6100					6105			
Pro	Ile	Gly	Thr	Ala	Leu	Ala	Gly	Arg	Thr	Asp	Asp	Ala	Leu	Asp
6110						6115					6120			
Glu	Leu	Val	Gly	Phe	Phe	Val	Asn	Met	Leu	Val	Leu	Arg	Thr	Asp
6125						6130					6135			
Val	Ser	Gly	Asp	Pro	Gly	Phe	Gly	Thr	Leu	Leu	Arg	Arg	Val	Arg
6140						6145					6150			
Glu	Thr	Gly	Leu	Ala	Ala	Tyr	Ala	His	Gln	Asp	Val	Pro	Phe	Asp
6155						6160					6165			
Gln	Val	Val	Glu	Glu	Leu	Val	Thr	Glu	Arg	Ser	Leu	Ala	Arg	His
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Pro	Leu	Phe	Gln	Val	Ala	Leu	Thr	Val	Gln	Asn	Ala	Pro	Gly	Ala
6185						6190					6195			
Arg	Pro	Arg	Leu	Ala	Gly	Leu	Glu	Val	Gly	Thr	Glu	Pro	Ile	Glu
6200						6205					6210			
His	Gly	Ile	Ala	Arg	Tyr	Asp	Leu	Thr	Leu	Thr	Val	Thr	Glu	Arg
6215						6220					6225			
Arg	Asp	Glu	His	Gly	Ala	Pro	Asp	Gly	Leu	Glu	Gly	His	Leu	Glu
6230						6235					6240			
Phe	Ser	Arg	Asp	Leu	Phe	Asp	Ala	Pro	Thr	Val	Ala	Thr	Leu	Gly
6245						6250					6255			
Asp	Arg	Leu	Ile	Arg	Leu	Leu	Thr	Ala	Ala	Val	Ala	Asp	Pro	Glu
6260						6265					6270			
Leu	Pro	Leu	Ser	Arg	Ile	Asp	Leu	Met	Ala	Pro	Ala	Glu	Arg	Arg
6275						6280					6285			

Asn Val	Leu Glu Gly Trp	Ser Thr Ala Arg Arg	Asp Val Pro Ala
6290		6295	6300
Ala Thr	Val Pro Glu Leu	Val Ala Ala Gln Val	Ala Arg Arg Pro
6305		6310	6315
Gly Ala	Val Ala Leu Arg	Ser Glu Asp Gly Glu	Ile Thr Tyr Ala
6320		6325	6330
Glu Leu	Asp Ala Arg Ala	Gly Arg Leu Ala Ala	Val Leu Arg Arg
6335		6340	6345
Arg Gly	Ile Gly Pro Glu	Ser Arg Val Ala Val	Leu Leu Pro Arg
6350		6355	6360
Gly Val	Glu Gln Val Val	Ala Phe Leu Ala Val	Val Arg Ala Gly
6365		6370	6375
Gly Thr	Tyr Leu Pro Ile	Asp Pro Ala Tyr Pro	Arg Asp Arg Val
6380		6385	6390
Asp Tyr	Leu Val Arg Asp	Ala Glu Pro Ala Cys	Leu Leu Thr Val
6395		6400	6405
Ala Gly	His Arg Ala Ala	Ala Pro Ala Ala Pro	Ala Val Val Glu
6410		6415	6420
Leu Asp	Asp Pro Ala Thr	Ala Ala Glu Ile Ala	Asp Ala Glu Pro
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Glu Pro	Pro Val Ala Val	Arg Pro Thr His Ser	Ala Tyr Leu Ile
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Tyr Thr	Ser Gly Ser Thr	Gly Arg Pro Lys Gly	Val Val Val Thr
6455		6460	6465
His Arg	Gly Val Ala Ala	Leu Val Ala Thr Gln	Ala Glu Arg Leu
6470		6475	6480
Ala Val	Thr Gly Glu Ser	Arg Val Leu Gln Phe	Ala Ser Val Gly
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Phe Asp	Ala Ser Ile Trp	Glu Met Val Met Ala	Leu Cys Ala Gly
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Ala Thr	Leu Val Val Ala	Pro Ala Asp Asp Leu	Leu Pro Gly Pro
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Ala Leu	Ala Ala Thr Leu	Ser Gly His Ala Val	Thr His Ala Thr
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Leu Pro	Pro Ala Val Leu	Ala Ala Ser Ala Pro	Gly Asp Leu Ala
6545		6550	6555
Pro Leu	Ala Val Leu Val	Ser Ala Gly Glu Ala	Leu Gly Pro Asp
6560		6565	6570
Leu Val	Arg Gln Phe Ala	Pro Gly Arg Ala Leu	Val Asn Ala Tyr
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Gly	Pro	Thr	Glu	Thr	Thr	Val	Cys	Ala	Thr	Ala	Ser	Ala	Pro	Leu
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Val	Thr	Gly	Glu	Leu	Tyr	Val	Ser	Gly	Ala	Ser	Leu	Ala	Arg	Gly
6635						6640					6645			
Tyr	Ala	Gly	Arg	Ala	Ala	Leu	Thr	Ala	Glu	Arg	Phe	Val	Ala	Cys
6650						6655					6660			
Pro	Phe	Ala	Pro	Gly	Glu	Arg	Met	Tyr	Arg	Thr	Gly	Asp	Arg	Ala
6665						6670					6675			
Arg	Trp	Asp	Ala	Ala	Gly	Arg	Leu	Thr	Phe	Ala	Gly	Arg	Ala	Asp
6680						6685					6690			
Asp	Gln	Val	Lys	Ile	Arg	Gly	Phe	Arg	Val	Glu	Pro	Gly	Glu	Val
6695						6700					6705			
Ala	Ala	Val	Leu	Gly	Glu	His	Pro	Ala	Val	Ala	Arg	Ala	Ala	Val
6710						6715					6720			
Val	Ala	Arg	Thr	Asp	Gly	Pro	Gln	Gly	Ala	Arg	Leu	Val	Ala	Tyr
6725						6730					6735			
Leu	Val	Ala	Ala	Asp	Pro	Ala	Gly	Pro	Asp	Leu	Ala	Ala	Ala	Val
6740						6745					6750			
Arg	Ala	Tyr	Ala	Ala	Ala	Thr	Leu	Pro	Ala	His	Leu	Leu	Pro	Ala
6755						6760					6765			
Ala	Phe	Val	Pro	Leu	Asp	Arg	Leu	Pro	Leu	Thr	Thr	Asn	Gly	Lys
6770						6775					6780			
Leu	Asp	Arg	Ala	Ala	Leu	Pro	Glu	Pro	Glu	Thr	Gly	Ala	Gly	Arg
6785						6790					6795			
Glu	Pro	Ser	Gly	Pro	Val	Glu	Arg	Leu	Leu	Cys	Glu	Ala	Phe	Ala
6800						6805					6810			
Asp	Val	Leu	Gly	Leu	Asp	Arg	Val	Gly	Ala	Asp	Gly	His	Phe	Phe
6815						6820					6825			
Asp	Leu	Gly	Gly	His	Ser	Leu	Leu	Ala	Thr	Arg	Leu	Leu	Ser	Arg
6830						6835					6840			
Leu	Arg	Ser	Ala	Ala	Gly	Ile	Asp	Val	Pro	Val	Arg	Val	Leu	Phe
6845						6850					6855			
Glu	Asn	Pro	Thr	Pro	Ala	Gly	Leu	Ala	Ala	Trp	Val	Glu	Thr	His
6860						6865					6870			
Ala	Gly	Ser	Arg	Arg	Lys	Ser	Arg	Pro	Ala	Leu	Arg	Pro	Met	Arg
6875						6880					6885			
His	Gln	Lys	Glu	Ser										

6890

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 <211> 8695
 <212> PRT
 <213> Actinoplanes sp.

<400> 15

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Leu	Glu	Gly	Pro	Ser	Ala	Thr	Tyr	Asn	Ile	Pro	Leu	Val	Leu	Gly	Leu	20	25	30	
Thr	Gly	Thr	Val	Asp	Ala	Ala	Ala	Leu	Glu	Thr	Ala	Leu	Arg	Asp	Val	35	40	45	
Leu	Glu	Arg	His	Glu	Val	Leu	Arg	Thr	Val	Tyr	Pro	Asp	Ala	Gly	Gly	50	55	60	
Glu	Pro	His	Gln	Arg	Ile	Leu	Pro	Leu	Gly	Glu	Thr	Gly	Phe	Gly	Leu	65	70	75	80
Arg	Val	Ala	Glu	Val	Thr	Asp	Gly	Glu	Leu	Asp	Ala	Ala	Val	Ala	Asp	85	90	95	
Ala	Thr	Gly	His	Ala	Phe	Asp	Leu	Ala	Thr	Glu	Ile	Pro	Val	Arg	Ala	100	105	110	
Ser	Leu	Leu	Thr	Val	Glu	Pro	Gly	Arg	His	Val	Leu	Ala	Leu	Val	Leu	115	120	125	
His	His	Ile	Ala	Ala	Asp	Gly	Trp	Ser	Met	Gly	Pro	Leu	Leu	Arg	Asp	130	135	140	
Leu	Ser	Thr	Ala	Tyr	Thr	Ala	Arg	Leu	Ala	Gly	Gly	Glu	Pro	Ala	Trp	145	150	155	160
Ser	Pro	Leu	Pro	Val	Gln	Tyr	Ala	Asp	Tyr	Ala	Leu	Trp	Gln	Gln	Glu	165	170	175	
Val	Leu	Gly	Ala	Gly	Asp	Asp	Pro	Glu	Ser	Leu	Leu	Arg	Glu	Gln	Val	180	185	190	
Gly	Tyr	Trp	Arg	Ser	Ala	Leu	Ala	Gly	Ala	Pro	Glu	Glu	Leu	Arg	Leu	195	200	205	
Pro	Ala	Asp	His	Arg	Arg	Pro	Pro	Val	Ser	Ser	Ser	Arg	Ala	His	Met	210	215	220	
Ala	Glu	Phe	Ala	Val	Pro	Ala	Ala	Ala	His	Gly	Asp	Leu	Thr	Ala	Leu	225	230	235	240
Thr	Arg	Glu	Leu	Gly	Ala	Thr	Leu	Phe	Met	Ala	Val	His	Ala	Ala	Thr	245	250	255	
Ala	Met	Val	Leu	Ser	Gly	Leu	Gly	Ala	Gly	Asp	Asp	Leu	Pro	Ile	Gly	260	265	270	
Thr	Val	Val	Ala	Gly	Arg	Thr	Asp	Ala	Gly	Leu	Asp	Asp	Leu	Val	Gly				

275					280					285					
Cys	Phe	Val	Asn	Asn	Leu	Val	Ile	Arg	Ala	Asp	Leu	Thr	Gly	Asp	Pro
290						295					300				
Thr	Phe	Ala	Asp	Leu	Leu	Arg	Gln	Val	Arg	Glu	Arg	Ala	Leu	Asp	Ala
305					310					315					320
Tyr	Gly	His	Gln	Asp	Val	Pro	Phe	Glu	Lys	Leu	Val	Glu	Glu	Leu	Ala
				325					330					335	
Pro	Ser	Arg	Ser	Leu	Ser	Arg	His	Pro	Leu	Phe	Gln	Val	Ala	Val	Ala
			340					345					350		
Val	Glu	Thr	Asp	Asp	Leu	Ile	Gly	Gly	Arg	Gly	Gly	Gly	Pro	Ala	Leu
		355					360					365			
Arg	Leu	Pro	Gly	Leu	Gly	Ile	Glu	Val	Leu	Pro	Gly	Glu	Pro	Ser	Ala
	370					375					380				
Arg	Asp	Leu	Asp	Leu	Asp	Leu	Val	Val	Arg	Glu	Thr	Phe	Asp	Ala	Glu
385					390					395					400
Gly	Arg	Pro	Ala	Gly	Leu	Thr	Gly	Ala	Leu	Ile	Gly	Ala	Ala	Gly	Leu
				405					410					415	
Phe	Asp	Ala	Ala	Ser	Val	Glu	Arg	Leu	Ala	Ala	Leu	Leu	Ala	Arg	Ala
			420					425					430		
Leu	Glu	Ala	Leu	Ala	Ala	Asp	Pro	Arg	Thr	Arg	Ala	Gly	Asp	Leu	Asp
		435					440					445			
Leu	Leu	Ser	Pro	Ala	Asp	Arg	Arg	Leu	Ile	Leu	Arg	Gly	Trp	Asn	Asp
	450					455					460				
Thr	Ala	Ala	Pro	Ala	Pro	Ala	Gly	Leu	Val	Pro	Asp	Leu	Phe	Ala	Ala
465					470					475					480
Gln	Ala	Ala	Arg	Thr	Pro	Asp	Ala	Val	Ala	Val	Ala	Gly	Pro	Asp	Arg
				485					490					495	
Glu	Leu	Thr	Tyr	Ala	Glu	Leu	Asp	Glu	Arg	Ser	Gly	Arg	Leu	Ala	Arg
			500					505					510		
Trp	Leu	Ile	Arg	Arg	Gly	Val	Ala	Ala	Asp	Thr	Arg	Val	Ala	Leu	Val
		515					520					525			
Leu	Glu	Arg	Ser	Ala	Glu	Leu	Pro	Val	Ala	Ile	Leu	Ala	Val	Leu	Lys
	530					535					540				
Ala	Gly	Gly	Ala	Tyr	Leu	Pro	Ile	Asp	Pro	Ala	Gln	Pro	Pro	Arg	Arg
545					550					555					560
Ile	Ala	Asp	Ile	Val	Ala	Asp	Ala	Ala	Pro	Ala	Leu	Val	Leu	Ala	Gln
				565					570					575	
Ala	Ser	Thr	Ala	Asp	Val	Val	Ala	Asp	Ala	Ser	Pro	Ala	Leu	Val	Leu
			580					585					590		
Ala	Pro	Ala	Ser	Asp	Gly	Val	Pro	Thr	Gly	Ala	Val	Pro	Val	His	Leu
		595					600					605			

Leu Asp Ser Pro Ala Val Arg Asp Glu Val Ala Gln Cys Pro Ala Gly
 610 615 620
 Ala Val Thr Asp Ala Asp Arg Arg Gly Val Leu Leu Gly Gly His Ala
 625 630 635 640
 Ala Tyr Val Ile Tyr Thr Ser Gly Ser Thr Gly Arg Pro Lys Gly Val
 645 650 655
 Val Val Ser His Asp Ala Phe Ala Asn Leu Val Leu Asp Gln Arg Arg
 660 665 670
 Leu Gly Ile Gly Pro Gly Ser Arg Val Ala Gln Phe Ala Ser Pro Gly
 675 680 685
 Phe Asp Met Phe Val Asp Glu Trp Ser Met Ala Leu Leu Ala Gly Ala
 690 695 700
 Ala Leu Val Ile Val Pro Pro Glu Arg Arg Leu Gly Ala Asp Leu Ala
 705 710 715 720
 Ala Phe Leu Thr Glu Arg Gly Val Thr His Ala Thr Leu Pro Pro Ala
 725 730 735
 Val Val Ala Thr Leu Pro Glu Glu Ser Leu Pro Arg Ser Phe Val Leu
 740 745 750
 Asp Ile Gly Gly Asp Ala Leu Pro Asp Asp Leu Ala Arg Arg Trp Leu
 755 760 765
 Arg Asp Gly Arg Trp Leu Gly Asn Ser Tyr Gly Pro Thr Glu Thr Thr
 770 775 780
 Val Asn Ala Ala Thr Trp Arg Cys Glu Pro Gly Thr Trp Glu Gly Ala
 785 790 795 800
 Thr Pro Ile Gly Arg Pro Val Ala Asn Leu Arg Ala Tyr Val Leu Asp
 805 810 815
 Gly Arg Leu Arg Pro Val Pro Val Gly Val Glu Gly Glu Leu Tyr Val
 820 825 830
 Ser Gly Ala Gly Leu Ala Arg Gly Tyr Leu Asn Arg Ala Gly Leu Thr
 835 840 845
 Ala Gly Ser Phe Val Ala Cys Pro Phe Glu Pro Gly Glu Arg Met Tyr
 850 855 860
 Arg Thr Gly Asp Ile Val Arg Trp Asp Ala Arg Gly Arg Leu Val Tyr
 865 870 875 880
 Ala Gly Arg Ala Asp Asp Gln Ala Lys Ile Arg Gly Phe Arg Val Glu
 885 890 895
 Pro Gly Glu Val Glu Ala Val Leu Ala Ala Gly Pro Gly Val Asn Gln
 900 905 910
 Val Ala Val Ile Val Arg Glu Asp Val Pro Gly Asp Lys Arg Leu Val
 915 920 925

Ala Tyr Val Val Gly Gly Asp Val Glu Thr Leu Arg Ser Tyr Ala Gln
 930 935 940
 Gln Arg Leu Pro Gly Tyr Leu Val Pro Ser Ala Ile Val Ala Leu Ala
 945 950 955 960
 Glu Leu Pro Leu Thr Pro Ser Ala Lys Val Asp Arg Arg Ala Leu Pro
 965 970 975
 Val Pro Asp Tyr Gly Arg Asp Ala Gly Gly Gly Arg Ala Pro Ala Asn
 980 985 990
 Ala Arg Glu Glu Val Leu Cys Arg Ala Phe Ala Glu Val Leu Gly Val
 995 1000 1005
 Glu Arg Val Gly Val Glu Asp Asp Phe Phe Ala Leu Gly Gly His
 1010 1015 1020
 Ser Leu Leu Val Val Ser Leu Val Glu Arg Leu Arg Arg Gln Gly
 1025 1030 1035
 Ile Ser Val Pro Val Arg Ala Leu Phe Thr Thr Pro Thr Pro Ala
 1040 1045 1050
 Gly Leu Ala Glu Ala Val Gly Asp Gly Ala Val Val Val Pro Pro
 1055 1060 1065
 Asn Leu Ile Pro Glu Gly Ala Ala Glu Leu Thr Pro Glu Met Leu
 1070 1075 1080
 Pro Leu Ala Asp Leu Thr Ala Asp Glu Leu Ala Val Val Val Asp
 1085 1090 1095
 Ser Val Pro Gly Gly Ala Ala Asn Ile Ala Asp Val Tyr Pro Leu
 1100 1105 1110
 Ala Pro Leu Gln Glu Gly Ile Phe Phe His His Met Met Ala Asp
 1115 1120 1125
 Arg Asp Ser Ala Asp Val Tyr Val Thr Pro Thr Val Val Glu Phe
 1130 1135 1140
 Asp Ser Arg Asp Arg Leu Asp Gly Phe Leu Ala Ala Leu Gln Gln
 1145 1150 1155
 Val Val Asp Arg Thr Asp Val Tyr Arg Thr Ser Val Val Trp Gln
 1160 1165 1170
 Gly Leu Arg Glu Pro Val Gln Val Val Trp Arg His Ala Arg Leu
 1175 1180 1185
 Pro Val Asp Glu Val Val Leu Arg Asp Asp Leu Asp Pro Val Glu
 1190 1195 1200
 Gln Leu Asn Ala Leu Gly Thr Ala Trp Met Asp Leu Ser Glu Ala
 1205 1210 1215
 Pro Leu Val Gln Ala Val Val Ala Ala Arg Pro Gly Asp Pro Gln
 1220 1225 1230
 Arg Trp Leu Ala Val Leu Arg Ile His His Leu Val Gln Asp His

1235	1240	1245
Thr Ala Leu Asp Ile Leu Leu 1250	Glu Glu Leu Ala Ala 1255	Tyr Leu Ala 1260
Gly Arg Gly Gly Asp Leu Pro 1265	Glu Pro Val Pro Phe 1270	Arg Glu Phe 1275
Val Ala His Thr Arg Leu Gly 1280	Val Pro Arg Glu Glu 1285	His Glu Arg 1290
Tyr Phe Ala Gly Leu Leu Gly 1295	Asp Val Thr Glu Thr 1300	Thr Ala Pro 1305
Tyr Gly Leu Leu Asp Val His 1310	Ser Gly Gly Leu Ala 1315	Ser Ala Gln 1320
Ala His Leu Arg Leu Asp Gly 1325	Pro Leu Gly Arg Arg 1330	Val Ala Ala 1335
Phe Ala Arg Glu His Gly Val 1340	Ser Pro Ala Thr Leu 1345	Phe His Leu 1350
Ala Trp Ala Arg Val Leu Gly 1355	Thr Leu Ala Gly Arg 1360	Asp Asp Val 1365
Val Phe Gly Thr Val Leu Phe 1370	Gly Arg Met Asn Ser 1375	Gly Ala Gly 1380
Ala Asp Arg Val Pro Gly Leu 1385	Phe Ile Asn Thr Leu 1390	Pro Val Arg 1395
Val Arg Leu Gly Ala Pro Val 1400	Gly Asp Ala Leu Asp 1405	Gly Leu Arg 1410
Asp Gln Leu Ile Glu Leu Ile 1415	Ala His Glu His Ala 1420	Pro Leu Ala 1425
Val Ala Gln Gln Ala Ala Asn 1430	Leu Phe Gly Arg Pro 1435	Leu Phe Thr 1440
Ser Ile Phe Asn Tyr Arg Tyr 1445	Ala Arg Gly Ala Glu 1450	Pro Ala Gly 1455
Ala Ala Leu Asp Gly Ile Arg 1460	Leu Leu Ser Ala Arg 1465	Asp Leu Thr 1470
Asn Tyr Pro Leu Ala Val Ala 1475	Val Asp Ala Glu Gly 1480	Asp Thr Phe 1485
Ser Leu Thr Val Asp Ala Val 1490	Ala Pro Ala Asp Pro 1495	Val Gln Val 1500
Gly Glu Leu Leu Val Thr Ala 1505	Leu Arg Asn Leu Thr 1510	Arg Thr Ala 1515
Glu Asn Ala Pro Gly Thr Pro 1520	Leu Ala Ala Val Gly 1525	Val Leu Gly 1530
Glu Asp Glu Leu Ser Arg Val 1535	Val Ser Gly Trp Asn 1540	Asp Thr Ala 1545

Arg	Arg	Val	Arg	Gln	Ala	Ser	Val	Pro	Glu	Leu	Phe	Ala	Glu	Arg
1550						1555					1560			
Val	Ala	Ala	Ala	Pro	Gly	Ala	Pro	Ala	Val	Ala	Ala	Gly	Asp	Leu
1565						1570					1575			
Arg	Trp	Thr	Tyr	Ala	Asp	Leu	Asp	Ala	Arg	Ser	Asp	Ala	Leu	Ala
1580						1585					1590			
Arg	Ser	Leu	Val	Ala	Ala	Gly	Val	Thr	Ala	Glu	Ser	Pro	Val	Val
1595						1600					1605			
Val	Ala	Leu	Glu	Arg	Ser	Ala	Asp	Val	Leu	Thr	Ala	Phe	Leu	Ala
1610						1615					1620			
Val	Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp
1625						1630					1635			
Pro	Arg	Ala	Arg	Val	Asp	Ala	Val	Ile	Ala	Asp	Cys	Ala	Ala	Trp
1640						1645					1650			
Ile	Ala	Val	Ala	Asp	Arg	Pro	Met	Thr	Gly	Leu	Thr	Val	Val	Pro
1655						1660					1665			
Ala	Asn	Arg	Ala	Gly	Asp	Pro	Ala	Val	Ala	Leu	Pro	Pro	Arg	Pro
1670						1675					1680			
Leu	Pro	Gly	Ala	Ala	Ala	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr
1685						1690					1695			
Gly	Arg	Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln	Asn	Val	Val	Asp
1700						1705					1710			
Leu	Val	Thr	Asp	Arg	Cys	Trp	Gly	Pro	Thr	Pro	Arg	Val	Leu	Phe
1715						1720					1725			
His	Ala	Pro	His	Ala	Phe	Asp	Ala	Ser	Ser	Phe	Glu	Leu	Trp	Val
1730						1735					1740			
Pro	Leu	Leu	Thr	Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Gly	Glu	Ser
1745						1750					1755			
Ile	Asp	Thr	Gly	Val	Leu	Arg	Gln	Leu	Ile	Arg	Ala	His	Glu	Leu
1760						1765					1770			
Thr	His	Val	His	Val	Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Ala	Glu
1775						1780					1785			
Asp	Pro	Ser	Cys	Phe	Ala	Gly	Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly
1790						1795					1800			
Asp	Val	Val	Pro	Ala	Glu	Ala	Val	Arg	Arg	Val	Leu	Asp	Ala	Asn
1805						1810					1815			
Pro	Gly	Val	Arg	Val	Arg	Gln	Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr
1820						1825					1830			
Leu	Cys	Ala	Thr	Gln	His	Val	Val	Arg	Glu	Pro	Ser	Pro	Val	Leu
1835						1840					1845			

Pro	Ile	Gly	Arg	Pro	Leu	Asp	Asn	Thr	Arg	Val	Tyr	Val	Leu	Asp
1850						1855					1860			
Gly	Leu	Leu	Gln	Pro	Val	Pro	Val	Gly	Val	Thr	Gly	Glu	Leu	Tyr
1865						1870					1875			
Ile	Ala	Gly	Ala	Gly	Val	Ala	Arg	Gly	Tyr	Ala	Asp	Met	Pro	Gly
1880						1885					1890			
Thr	Thr	Ala	Glu	Arg	Phe	Val	Ala	Asp	Pro	Phe	Thr	Ala	Gly	Gly
1895						1900					1905			
Arg	Leu	Tyr	Arg	Thr	Gly	Asp	Leu	Val	Arg	Trp	Thr	Gly	Glu	Gly
1910						1915					1920			
Glu	Leu	Val	Phe	Ala	Gly	Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg
1925						1930					1935			
Gly	Tyr	Arg	Val	Glu	Pro	Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Ala
1940						1945					1950			
Leu	Pro	Gly	Val	Ser	Gln	Ala	Ala	Val	Ile	Val	Arg	Glu	Asp	Val
1955						1960					1965			
Pro	Gly	Asp	Lys	Arg	Leu	Val	Ala	Tyr	Leu	Val	Ala	Ala	Pro	Glu
1970						1975					1980			
Thr	Val	Glu	Ala	Ala	Arg	Ala	His	Ala	Glu	Gln	Arg	Leu	Pro	Ser
1985						1990					1995			
Tyr	Leu	Val	Pro	Ser	Ala	Phe	Val	Gln	Leu	Asp	Ala	Leu	Pro	Leu
2000						2005					2010			
Thr	Gly	Asn	Gln	Lys	Val	Asp	Arg	Ala	Ala	Leu	Pro	Ala	Pro	Leu
2015						2020					2025			
Gly	Phe	Glu	Ala	Gly	Ala	Gly	Arg	Ala	Pro	Ala	Asp	Ala	Arg	Glu
2030						2035					2040			
Glu	Leu	Val	Gly	Ala	Ala	Phe	Ala	Glu	Val	Leu	Asp	Leu	Gly	Arg
2045						2050					2055			
Val	Gly	Pro	Asp	Asp	Asp	Phe	Phe	Ala	Leu	Gly	Gly	His	Ser	Leu
2060						2065					2070			
Leu	Ala	Leu	Ala	Leu	Val	Glu	Arg	Leu	Arg	Arg	Gln	Gly	Leu	Gly
2075						2080					2085			
Val	Ser	Val	Arg	Ala	Val	Phe	Asp	Ala	Arg	Thr	Pro	Ala	Ala	Leu
2090						2095					2100			
Thr	Arg	Arg	Gly	Asp	Gly	Gly	Ala	Asp	Asp	Arg	Pro	Ala	Leu	Arg
2105						2110					2115			
Ala	Gly	Ala	Arg	Pro	Ala	Arg	Leu	Pro	Leu	Ser	Tyr	Ala	Gln	Arg
2120						2125					2130			
Arg	Leu	Trp	Phe	Leu	Ala	Gln	Leu	Glu	Gly	Pro	Ser	Ala	Thr	Tyr
2135						2140					2145			
Asn	Ile	Pro	Val	Ala	Leu	Arg	Leu	Glu	Gly	Asp	Leu	Asp	Arg	Asp

2150	2155	2160
Ala Leu Thr Ala Ala Leu Arg Asp Val Val Ala Arg His Glu Val 2165	2170	2175
Leu Arg Thr Val Phe Thr Val Ala Asp Gly Glu Pro Trp Gln His 2180	2185	2190
Ile Leu Asp Pro Ala Arg Ala Glu Pro Ala Leu Pro Val Val Asp 2195	2200	2205
Val Pro Ala Gly Arg Val Glu Glu Ala Val Ala Glu Ala Ala Ala 2210	2215	2220
Tyr Ala Phe Asp Leu Ala Arg Glu Ile Pro Leu Arg Ala Val Leu 2225	2230	2235
Leu Ala Pro Gly Asp Gly Thr His Val Leu Val Leu Val Leu His 2240	2245	2250
His Ile Ala Ala Asp Gly Trp Ser Met Arg Pro Leu Ala Arg Asp 2255	2260	2265
Leu Ala Thr Ala Tyr Ala Ala Arg Arg Arg Gly Gln Ala Pro Glu 2270	2275	2280
Ser Glu Thr Leu Pro Val Gln Tyr Ala Asp Tyr Ala Leu Trp Gln 2285	2290	2295
Arg Asp Leu Leu Gly Ser Asp Ser Asp Pro Ala Ser Leu Ile Ser 2300	2305	2310
Arg Gln Ile Ala His Trp Arg Glu Arg Leu Asp Gly Val Pro Glu 2315	2320	2325
Glu Leu Asp Leu Pro Ala Asp Arg Pro Arg Pro Ala Ala Ala Ser 2330	2335	2340
His Arg Gly His Leu His Ser Ala Glu Ile Pro Ala Asp Val His 2345	2350	2355
Arg Ser Leu Arg Arg Val Ala Ala Asp His Gly Ala Thr Val Phe 2360	2365	2370
Met Thr Leu Gln Ala Ala Val Ala Val Leu Leu Ser Arg Leu Gly 2375	2380	2385
Ala Gly Thr Asp Val Pro Ile Gly Thr Val Val Ala Gly Arg Ala 2390	2395	2400
Asp Arg Ala Leu Glu Asn Leu Val Gly Phe Phe Val Asn Thr Leu 2405	2410	2415
Val Leu Arg Thr Asp Leu Thr Gly Asp Pro Arg Leu Thr Asp Val 2420	2425	2430
Leu Gly Gln Val Arg Glu Leu Thr Leu Arg Ala Leu Ala His Gln 2435	2440	2445
Asp Val Pro Phe Glu Lys Leu Val Glu Glu Leu Thr Pro Ala Arg 2450	2455	2460

Ser	Leu	Ala	Arg	His	Pro	Leu	Phe	Gln	Val	Met	Val	Thr	Leu	Asp
2465						2470					2475			
Gly	Gly	Gly	Pro	Asp	Gly	Ala	Glu	Leu	Pro	Gly	Leu	Ala	Met	Ser
2480						2485					2490			
Val	Val	Pro	Thr	Gly	Ala	Val	Pro	Ala	Lys	Phe	Asp	Leu	Asp	Leu
2495						2500					2505			
Thr	Phe	Thr	Glu	Thr	Phe	Asp	Ala	Ala	Gly	Glu	Pro	Ala	Gly	Leu
2510						2515					2520			
Arg	Val	Asp	Leu	Ile	Ala	Ala	Ala	Asp	Leu	Phe	Asp	Ala	Gly	Thr
2525						2530					2535			
Ala	Ala	Arg	Leu	Ala	Gly	Tyr	Leu	Ser	Arg	Val	Leu	Gly	Val	Leu
2540						2545					2550			
Ala	Ala	Asp	Pro	Arg	Arg	Arg	Leu	Ala	Glu	Val	Asp	Pro	Leu	Glu
2555						2560					2565			
Ala	Glu	Glu	Ser	Arg	Leu	Met	Leu	Ala	Ala	Gly	Glu	Glu	Pro	Ala
2570						2575					2580			
Pro	Ala	Leu	Pro	Glu	Ile	Thr	Val	Ala	Ala	Leu	Val	Ala	Glu	Gln
2585						2590					2595			
Cys	Ala	Arg	Thr	Pro	Gly	Ala	Val	Ala	Val	Thr	Gly	Pro	Asp	Ala
2600						2605					2610			
Ser	Leu	Thr	Tyr	Ala	Glu	Leu	Asp	Glu	Arg	Ala	Ala	Arg	Ile	Ala
2615						2620					2625			
Arg	Trp	Leu	Arg	Arg	His	Gly	Ala	Gly	Pro	Gly	Ala	Ala	Val	Cys
2630						2635					2640			
Val	Leu	Met	Glu	Arg	Ser	Ala	Glu	Leu	Val	Ala	Val	Leu	Leu	Gly
2645						2650					2655			
Val	Met	Arg	Ala	Gly	Ala	Ala	Tyr	Val	Pro	Val	Asp	Pro	Ala	Tyr
2660						2665					2670			
Pro	Ala	Glu	Arg	Ile	Arg	Phe	Val	Val	Thr	Asp	Ala	Arg	Ala	Ala
2675						2680					2685			
Cys	Val	Val	Ser	Glu	Ser	Ala	Ser	Ala	Gly	Leu	Val	Pro	Asp	Gly
2690						2695					2700			
Val	Pro	Cys	Leu	Ala	Ile	Asp	Asp	Pro	Ala	Ala	Ala	Ala	Glu	Pro
2705						2710					2715			
Ala	Glu	Pro	Gly	Asp	Asp	Pro	Gly	Asp	Ala	Ala	Gly	Pro	Arg	Pro
2720						2725					2730			
Asp	Asp	Pro	Ala	Tyr	Ile	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Thr
2735						2740					2745			
Pro	Lys	Gly	Val	Val	Val	Ser	His	Arg	Asn	Val	Val	Ala	Leu	Leu
2750						2755					2760			

Thr	Ala	Thr	Arg	Pro	Leu	Phe	Gly	Phe	Ala	Gly	Asp	Glu	Val	Trp
2765						2770					2775			
Ser	Trp	Phe	His	Ser	Val	Ala	Phe	Asp	Phe	Ser	Val	Trp	Glu	Leu
2780						2785					2790			
Trp	Gly	Ala	Leu	Thr	His	Gly	Gly	Arg	Val	Val	Val	Val	Pro	Tyr
2795						2800					2805			
Ala	Val	Ser	Arg	Ser	Pro	Arg	Asp	Phe	Trp	Glu	Leu	Val	Val	Arg
2810						2815					2820			
Glu	Gly	Val	Thr	Val	Leu	Ser	Gln	Thr	Pro	Ser	Ala	Phe	Ala	Gln
2825						2830					2835			
Leu	Met	Ala	Ala	Ala	Gly	Asp	Asp	Asp	Arg	Asp	Ala	Leu	Arg	Phe
2840						2845					2850			
Val	Val	Phe	Gly	Gly	Glu	Ala	Leu	Asp	Pro	Gly	Arg	Leu	Ala	Gly
2855						2860					2865			
Trp	Leu	Ala	Arg	Arg	Pro	Asp	Lys	Pro	Arg	Leu	Val	Asn	Met	Tyr
2870						2875					2880			
Gly	Ile	Thr	Glu	Thr	Thr	Val	His	Thr	Thr	Tyr	Gln	His	Ile	Ala
2885						2890					2895			
Pro	Gly	Thr	Thr	Gly	Ser	Val	Ile	Gly	Arg	Gly	Leu	Pro	Gly	Phe
2900						2905					2910			
Gly	Leu	Tyr	Val	Leu	Asp	Glu	Ala	Leu	Arg	Pro	Val	Pro	Ala	Gly
2915						2920					2925			
Val	Pro	Gly	Glu	Val	Tyr	Ala	Arg	Gly	Pro	Gln	Val	Ala	Arg	Gly
2930						2935					2940			
Tyr	Ile	Gly	Arg	Pro	Gly	Leu	Thr	Ala	Glu	Arg	Phe	Val	Ala	Ser
2945						2950					2955			
Pro	Phe	Ala	Pro	Gly	Glu	Arg	Met	Tyr	Arg	Thr	Gly	Asp	Val	Ala
2960						2965					2970			
Arg	Trp	Thr	Ala	Asp	Gly	Arg	Leu	Val	Phe	Ala	Gly	Arg	Ser	Asp
2975						2980					2985			
Asp	Gln	Ile	Lys	Ile	Arg	Gly	Phe	Arg	Ile	Glu	Pro	Gly	Glu	Val
2990						2995					3000			
Glu	Ala	Val	Leu	Ala	Ala	Gly	Pro	Gly	Val	Ser	Gln	Ala	Ala	Val
3005						3010					3015			
Ile	Val	Arg	Glu	Asp	Val	Pro	Gly	Asp	Lys	Arg	Leu	Val	Ala	Tyr
3020						3025					3030			
Val	Val	Gly	Gly	Asp	Ala	Glu	Thr	Leu	Arg	Ser	His	Ala	Gln	Gln
3035						3040					3045			
Arg	Leu	Pro	Gly	Tyr	Leu	Val	Pro	Ser	Ala	Phe	Val	Glu	Leu	Asp
3050						3055					3060			
Arg	Leu	Pro	Leu	Thr	Val	Asn	Gly	Lys	Leu	Asp	Arg	Arg	Ala	Leu

3065					3070					3075				
Pro Val	Pro Asp	Tyr Gly	Arg	Asp Ala	Gly Gly	Gly	Arg Ala	Pro						
3080			3085			3090								
Ala Asn	Ala Arg	Glu Glu	Val	Leu Cys	Arg Ala	Phe	Ala Glu	Val						
3095			3100			3105								
Leu Gly	Val Glu	Arg Val	Gly	Val Glu	Asp Asp	Phe	Phe Ala	Leu						
3110			3115			3120								
Gly Gly	His Ser	Leu Leu	Val	Val Ser	Leu Val	Glu	Arg Leu	Arg						
3125			3130			3135								
Arg Gln	Gly Ile	Ser Val	Pro	Val Arg	Ala Leu	Phe	Thr Thr	Pro						
3140			3145			3150								
Thr Pro	Ala Gly	Leu Ala	Glu	Ala Val	Gly Asp	Gly	Ala Val	Val						
3155			3160			3165								
Val Pro	Pro Asn	Leu Ile	Pro	Glu Asp	Ala Ala	Glu	Leu Thr	Pro						
3170			3175			3180								
Glu Met	Leu Pro	Leu Ala	Asp	Leu Thr	Ala Asp	Glu	Leu Ala	Val						
3185			3190			3195								
Val Val	Ala Ser	Val Pro	Gly	Gly Ala	Ala Asn	Ile	Ala Asp	Val						
3200			3205			3210								
Tyr Pro	Leu Ala	Pro Leu	Gln	Glu Gly	Ile Phe	Phe	His His	Met						
3215			3220			3225								
Met Ala	Asp Arg	Asp Ser	Ala	Asp Val	Tyr Val	Thr	Pro Thr	Val						
3230			3235			3240								
Val Glu	Phe Asp	Ser Arg	Asp	Arg Leu	Asp Gly	Phe	Leu Ala	Ala						
3245			3250			3255								
Leu Gln	Gln Val	Val Asp	Arg	Thr Asp	Val Tyr	Arg	Thr Ser	Val						
3260			3265			3270								
Val Trp	Gln Gly	Leu Arg	Glu	Pro Val	Gln Val	Val	Trp Arg	His						
3275			3280			3285								
Ala Arg	Leu Pro	Ile Asp	Glu	Val Glu	Leu His	Glu	Gly Thr	Asp						
3290			3295			3300								
Pro Ala	Glu Gln	Leu Ile	Ala	Leu Ala	Thr Glu	Arg	Val Asp	Leu						
3305			3310			3315								
Asp Arg	Ala Pro	Leu Ile	Arg	Thr Thr	Thr Ala	Ala	Val Pro	Gly						
3320			3325			3330								
Ser Gly	Arg Trp	Leu Ala	Leu	Leu Arg	Ile His	His	Leu Val	Gln						
3335			3340			3345								
Asp His	Thr Thr	Leu Asp	Val	Leu Leu	Gly Glu	Leu	Arg Ala	Phe						
3350			3355			3360								
Leu Glu	Gly Arg	Gly Asp	Glu	Leu Pro	Glu Pro	Val	Pro Phe	Arg						
3365			3370			3375								

Glu Phe Val Ala Gln Ala Arg	Leu Gly Val Pro Arg	Glu Glu His
3380	3385	3390
Glu Arg Tyr Phe Ala Glu Leu	Leu Gly Asp Val Thr	Glu Thr Thr
3395	3400	3405
Ala Pro Tyr Gly Leu Thr Glu	Val His Gly Asp Gly	Ser Ala Ala
3410	3415	3420
Val His Ser Arg Arg Glu Val	Asp Asp Asp Leu Ala	Ala Arg Leu
3425	3430	3435
His Arg Leu Ala Arg Ser Leu	Gly Val Ser Pro Ala	Ala Leu Phe
3440	3445	3450
His Leu Ala Trp Ala Arg Val	Leu Gly Ala Val Ser	Gly Arg Asp
3455	3460	3465
Asp Val Val Phe Gly Thr Val	Leu Phe Gly Arg Met	Asn Ser Gly
3470	3475	3480
Ala Ala Ala Asp Arg Val Gln	Gly Leu Phe Ile Asn	Thr Leu Pro
3485	3490	3495
Val Arg Val Arg Leu Ala Ala	Gly Ser Thr Arg Asp	Ala Leu Thr
3500	3505	3510
Gly Leu Arg Asp Gln Leu Ala	Gly Leu Leu Val His	Glu His Ala
3515	3520	3525
Pro Leu Ala Leu Ala Gln Arg	Ala Ala Gly Ile Thr	Asp Gly Ser
3530	3535	3540
Pro Leu Phe Ala Ser Ile Phe	Asn Tyr Arg His Asn	Gln Asp Asp
3545	3550	3555
Pro Ala Ala Ser Ala Gly Leu	Glu Gly Ile Arg Thr	Val Tyr Ser
3560	3565	3570
Ala Glu His Thr Asn Tyr Pro	Leu Asp Ala Ser Ile	Asp Val Thr
3575	3580	3585
Gly Asp Arg Phe Ala Ile Thr	Val Asn Ala Val Ala	Pro Ala Asp
3590	3595	3600
Ala Ala Arg Ile Ala Glu Leu	Met His Thr Cys Leu	Gly His Leu
3605	3610	3615
Ala Asp Val Leu Glu Asp Ala	Pro Glu Thr Pro Leu	Ser Trp Val
3620	3625	3630
Ser Pro Leu Ser Ala Glu Asp	Leu Gly Arg Ile Val	Gly Asp Trp
3635	3640	3645
Asn Glu Thr Arg Arg Ala Val	Thr Arg Ala Ser Val	Pro Glu Leu
3650	3655	3660
Phe Ala Lys Gln Val Ala Ala	Thr Pro Asp Ala Ile	Ala Val Ala
3665	3670	3675

Gly	Glu	Gly	Val	Ser	Trp	Ser	Tyr	Arg	Glu	Leu	Asp	Val	Arg	Ser
3680						3685					3690			
Asp	Ala	Leu	Ala	Arg	Ser	Leu	Val	Ala	Ala	Gly	Val	Gly	Ile	Glu
3695						3700					3705			
Ser	Pro	Val	Val	Val	Ala	Leu	Asp	Arg	Ser	Pro	Glu	Val	Pro	Thr
3710						3715					3720			
Ala	Phe	Leu	Ala	Val	Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val
3725						3730					3735			
Asp	Leu	Ser	Trp	Pro	Gln	Ala	Arg	Val	Asp	Ala	Val	Ile	Ala	Asp
3740						3745					3750			
Cys	Ala	Ala	Arg	Val	Ala	Val	Ala	Asp	Arg	Pro	Met	Thr	Gly	Leu
3755						3760					3765			
Thr	Val	Val	Pro	Ala	Asp	Ala	Ala	Gly	Asp	Pro	Ala	Ala	Glu	Leu
3770						3775					3780			
Pro	Pro	Arg	Pro	Leu	Pro	Gly	Ala	Glu	Val	Tyr	Arg	Met	Tyr	Thr
3785						3790					3795			
Ser	Gly	Ser	Thr	Gly	Arg	Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln
3800						3805					3810			
Asn	Leu	Val	Asp	Leu	Ala	Thr	Asp	Thr	Cys	Trp	Gly	Pro	Thr	Pro
3815						3820					3825			
Arg	Val	Leu	Phe	His	Ala	Pro	His	Ala	Phe	Asp	Ala	Ser	Ser	Tyr
3830						3835					3840			
Glu	Ile	Trp	Val	Pro	Leu	Leu	Asn	Gly	Gly	Thr	Val	Val	Val	Ala
3845						3850					3855			
Pro	Gly	Arg	Ser	Ile	Asp	Ala	Ala	Val	Leu	Gly	Glu	Leu	Ile	Arg
3860						3865					3870			
Ala	His	Glu	Leu	Thr	His	Val	His	Val	Thr	Ala	Gly	Leu	Leu	Arg
3875						3880					3885			
Val	Leu	Asp	Pro	Ser	Cys	Phe	Ala	Gly	Leu	Thr	Glu	Val	Leu	Thr
3890						3895					3900			
Gly	Gly	Asp	Ala	Val	Ser	Ala	Glu	Ala	Val	Arg	Arg	Val	Met	Glu
3905						3910					3915			
Ala	Asn	Pro	Gly	Leu	Arg	Val	Arg	Gln	Leu	Tyr	Gly	Pro	Thr	Glu
3920						3925					3930			
Val	Thr	Leu	Cys	Ala	Thr	Gln	Gln	Val	Leu	Asp	Gly	Thr	Gly	Val
3935						3940					3945			
Pro	Ile	Gly	Arg	Pro	Leu	Asp	Asn	Thr	Arg	Val	Tyr	Val	Leu	Asp
3950						3955					3960			
Asp	Leu	Leu	Gln	Pro	Val	Pro	Val	Gly	Val	Thr	Gly	Glu	Leu	Tyr
3965						3970					3975			
Val	Ala	Gly	Ala	Gly	Leu	Ala	Arg	Gly	Tyr	Ala	Gly	Met	Pro	Gly

3980					3985					3990				
Leu	Thr	Ala	Glu	Arg	Phe	Val	Ala	Asp	Pro	Phe	Ser	Ser	Gly	Gly
3995						4000					4005			
Arg	Leu	Tyr	Arg	Thr	Gly	Asp	Leu	Val	Arg	Trp	Thr	Asp	Asp	Gly
4010						4015					4020			
Val	Leu	Val	Phe	Ala	Gly	Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg
4025						4030					4035			
Gly	Tyr	Arg	Val	Glu	Pro	Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Ala
4040						4045					4050			
His	Pro	Asp	Val	Ala	Gln	Val	Ala	Val	Val	Val	Arg	Glu	Asp	Thr
4055						4060					4065			
Pro	Gly	Asp	Lys	Arg	Leu	Val	Ala	Tyr	Val	Val	Gly	Gly	Asp	Val
4070						4075					4080			
Glu	Ala	Tyr	Ala	Gln	Glu	Arg	Leu	Pro	Gly	Tyr	Leu	Val	Pro	Ser
4085						4090					4095			
Ala	Phe	Val	His	Leu	Asp	Ala	Leu	Pro	Leu	Thr	Ser	Asn	Gln	Lys
4100						4105					4110			
Val	Asp	Arg	Ala	Ala	Leu	Pro	Ala	Pro	Ser	Val	Glu	Ser	Gly	Ala
4115						4120					4125			
Gly	Arg	Ala	Pro	Ala	Asp	Ala	Arg	Glu	Glu	Leu	Met	Cys	Ala	Ala
4130						4135					4140			
Phe	Ala	Glu	Val	Leu	Asp	Leu	Asp	Arg	Val	Gly	Val	Asp	Asp	Asp
4145						4150					4155			
Phe	Phe	Ala	Leu	Gly	Gly	His	Ser	Leu	Leu	Val	Val	Arg	Leu	Val
4160						4165					4170			
Gly	Arg	Ile	Arg	Gln	Val	Phe	Gly	Val	Glu	Val	Ser	Ala	Arg	Leu
4175						4180					4185			
Val	Phe	Asp	Ala	Arg	Thr	Pro	Ala	Gly	Val	Val	Ala	Arg	Leu	Ser
4190						4195					4200			
Glu	Gly	Gly	Thr	Ala	Arg	Glu	Ala	Val	Arg	Ala	Arg	Val	Arg	Pro
4205						4210					4215			
Ala	Arg	Val	Pro	Leu	Ser	Phe	Ala	Gln	Arg	Arg	Leu	Trp	Phe	Leu
4220						4225					4230			
Ser	Gln	Leu	Asp	Gly	Thr	Ser	Thr	Thr	Tyr	Asn	Ile	Pro	Val	Ala
4235						4240					4245			
Leu	Gln	Leu	Asp	Gly	Pro	Leu	Asp	Arg	Asp	Ala	Phe	Thr	Ala	Ala
4250						4255					4260			
Leu	His	Asp	Val	Val	Ala	Arg	His	Glu	Val	Leu	Arg	Thr	Val	Phe
4265						4270					4275			
Thr	Val	Ala	Asp	Gly	Glu	Pro	Trp	Gln	His	Ile	Leu	Asp	Thr	Pro
4280						4285					4290			

Gly	Val	Ala	Ala	Lys	Val	Asp	Leu	Asp	Leu	Ser	Leu	Ser	Glu	Ala
4595						4600					4605			
Tyr	Asp	Asp	Asp	Gly	Arg	Pro	Ala	Gly	Leu	Ala	Gly	Thr	Leu	Val
4610						4615					4620			
Ala	Ala	Ala	Asp	Leu	Phe	Glu	His	Gly	Thr	Ala	Glu	Arg	Ile	Ala
4625						4630					4635			
Gly	Tyr	Leu	Ala	Arg	Leu	Leu	Ala	Val	Leu	Pro	Ala	Asp	Pro	Gly
4640						4645					4650			
Ala	Arg	Leu	Gly	Asp	Val	Asp	Leu	Leu	Asp	Gly	Glu	Glu	Arg	Arg
4655						4660					4665			
Leu	Val	Leu	Thr	Gly	Trp	Asn	Asp	Thr	Thr	Ala	Ala	Val	Pro	Ala
4670						4675					4680			
Val	Ala	Val	Pro	Glu	Leu	Ile	Glu	Arg	Arg	Ala	Ala	Ala	Glu	Pro
4685						4690					4695			
Glu	Ala	Gly	Ala	Val	Trp	Cys	Gly	Asp	Thr	His	Leu	Arg	Tyr	Gly
4700						4705					4710			
Glu	Leu	Asn	Ala	Arg	Ala	Asn	Arg	Leu	Ala	Arg	Leu	Leu	Val	Glu
4715						4720					4725			
Arg	Gly	Ala	Gly	Pro	Glu	Ser	Ile	Val	Ala	Val	Cys	Leu	Glu	Arg
4730						4735					4740			
Ser	Ala	Asp	Leu	Val	Val	Thr	Leu	Leu	Ala	Val	Leu	Lys	Thr	Gly
4745						4750					4755			
Ala	Ala	Tyr	Leu	Pro	Ile	Asp	Pro	Gly	Tyr	Pro	Ala	Gly	Arg	Ile
4760						4765					4770			
Ala	Tyr	Met	Leu	Ala	Asp	Ala	Arg	Pro	Ala	Leu	Leu	Val	Thr	Ser
4775						4780					4785			
Pro	Ala	Val	Ala	Ser	Gly	Asp	Ser	Leu	Pro	Asp	Gly	Gly	Ala	Gln
4790						4795					4800			
Arg	Ile	Val	Leu	Gly	Asp	Pro	Asp	Thr	Ala	Ala	Ala	Leu	Asp	Gly
4805						4810					4815			
Leu	Ala	Gly	Thr	Asp	Leu	Leu	Val	Ser	Glu	Arg	Arg	Gly	Val	Thr
4820						4825					4830			
His	Pro	Ala	His	Pro	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr
4835						4840					4845			
Gly	Arg	Pro	Lys	Gly	Val	Val	Val	Pro	His	Gly	Ala	Leu	Thr	Asn
4850						4855					4860			
Phe	Val	Ala	Ala	Met	Ser	Asp	Arg	Leu	Ala	Leu	Gly	Ala	Gly	Asp
4865						4870					4875			
Arg	Leu	Leu	Ala	Val	Thr	Thr	Val	Ala	Phe	Asp	Ile	His	Val	Leu
4880						4885					4890			
Glu	Leu	Tyr	Val	Pro	Leu	Val	Gly	Gly	Ala	Gly	Val	Val	Val	Ala

4895	4900	4905
Glu Asp Ala Val Val Arg 4910	Asp Pro Ala Ala Val 4915	Ala Ala Leu Leu 4920
Asp Arg His Ala Val Thr 4925	Ile Val Gln Ala Thr 4930	Pro Ala Leu Trp 4935
Gln Ala Leu Leu Ala Gly 4940	His Ala Asp Ala Val 4945	Arg Asp Val Arg 4950
Leu Leu Val Gly Gly Glu 4955	Ala Leu Pro Pro Ala 4960	Leu Ala Gly Arg 4965
Met Ala Ala Ala Gly Arg 4970	Gly Val Thr Asn Leu 4975	Tyr Gly Pro Thr 4980
Glu Val Thr Val Trp Ala 4985	Thr Val Ala Asp Leu 4990	Gly Ala Ser Pro 4995
Ala Gly Pro Val Pro Ile 5000	Gly Thr Pro Leu Arg 5005	Asn Thr Arg Ala 5010
Phe Val Leu Asp Asp Ala 5015	Leu Arg Pro Val Pro 5020	Pro Gly Val Pro 5025
Gly Glu Leu Tyr Leu Ala 5030	Gly Asp Gln Leu Ala 5035	Arg Gly Tyr His 5040
Gly Arg Ala Gly Leu Thr 5045	Ala Glu Arg Phe Val 5050	Ala Asp Pro Phe 5055
Gly Arg Gly Glu Arg Met 5060	Tyr Arg Thr Gly Asp 5065	Arg Val Arg Trp 5070
Thr Arg Gly Gly Ser Leu 5075	Glu Phe Leu Gly Arg 5080	Val Asp Asp Gln 5085
Val Lys Ile Arg Gly Phe 5090	Arg Ile Glu Leu Gly 5095	Glu Val Glu Ala 5100
Ala Leu Ala Ala Phe Gly 5105	Pro Val Ala Arg Ala 5110	Ala Ala Ala Val 5115
Arg Glu Asp Val Pro Gly 5120	Asp Arg Arg Leu Val 5125	Gly Tyr Val Val 5130
Pro Ala Ala Gly Glu Pro 5135	Glu Pro Asp Pro Ala 5140	Ala Val Arg Ala 5145
His Val Ala Ala Gln Leu 5150	Pro Ala Tyr Met Val 5155	Pro Ser Ala Val 5160
Val Val Leu Pro Asp Leu 5165	Pro Leu Thr Ala Asn 5170	Gly Lys Leu Asp 5175
Arg Lys Ala Leu Pro Ala 5180	Pro Asp Tyr Gly Ala 5185	Ala Ser Ala Gly 5190
Arg Ala Pro Ala Asp Glu 5195	Arg Glu Ala Leu Ile 5200	Cys Ala Val Phe 5205

Ala Glu Thr Leu Gly Val Thr Asp Val Ala Ala Asp Ala Asp Phe 5210 5215 5220
Phe Ala Leu Gly Gly His Ser Leu Leu Ala Val Ser Leu Val Glu 5225 5230 5235
Arg Leu Arg Glu His Gly Ile Ala Val Pro Val Arg Ala Leu Phe 5240 5245 5250
Gln Ser Gly Thr Pro Glu Gly Leu Ala Ala Ala Ala Arg Ala Glu 5255 5260 5265
Gly Pro Asp Glu Pro Ala Val Pro Ala Asn Gly Ile Pro Asp Gly 5270 5275 5280
Ala Thr Ala Leu Thr Pro Ala Met Leu Thr Leu Val Asp Leu Asp 5285 5290 5295
Ala Glu Glu Ile Ala Arg Val Val Ala Ala Val Pro Gly Gly Ala 5300 5305 5310
Ala Asn Val Ala Asp Val Tyr Pro Leu Ala Pro Leu Gln Glu Gly 5315 5320 5325
Leu Leu Phe His Ser Leu Met Asp Gly Gly Asp Asp Val Tyr Val 5330 5335 5340
Leu Pro Ala Val Leu Gly Phe Asp Ser Arg Ser Arg Leu Asp Ala 5345 5350 5355
Phe Leu Ala Ala Leu Gln His Val Ile Asp Arg His Asp Thr Tyr 5360 5365 5370
Arg Thr Ala Val Val His Asp Gly Leu Arg Glu Pro Val Gln Val 5375 5380 5385
Val Trp Arg Arg Ala Thr Leu Pro Val Glu Glu Val Thr Leu Thr 5390 5395 5400
Ala Gly Ala Asp Pro Val Gln Glu Leu Leu Ala Thr Ala Pro Val 5405 5410 5415
Glu Phe Ala Leu Asp Arg Ala Pro Leu Leu Arg Val Arg Cys Ala 5420 5425 5430
Ala Arg Pro Asp Gly Gly Gly Trp Leu Ala Leu Leu Gln Ile His 5435 5440 5445
His Leu Val Gln Asp His Ala Thr Leu Asp Ala Met Leu Ala Glu 5450 5455 5460
Ile Gln Ala Phe Leu Ala Gly Arg Gly Gly Glu Leu Ala Ala Pro 5465 5470 5475
Glu Pro Phe Arg Gly Tyr Val Ala Arg Ala Arg Leu Ala Gly Ala 5480 5485 5490
Pro Ala Glu His Arg Ala Tyr Phe Ser Arg Leu Leu Gly Asp Val 5495 5500 5505

Thr	Glu	Ser	Thr	Ala	Pro	Tyr	Gly	Leu	Thr	Asp	Ala	Arg	Asp	Ala
5510						5515					5520			
Arg	Pro	Thr	Gly	Lys	Ala	His	Arg	Glu	Val	Asp	Arg	Arg	Leu	Ala
5525						5530					5535			
Ala	Arg	Val	Arg	Ala	Thr	Ala	Ser	Glu	Leu	Gly	Val	Ser	Pro	Ala
5540						5545					5550			
Thr	Val	Phe	His	Leu	Ala	Trp	Ala	Arg	Val	Leu	Gly	Thr	Leu	Ala
5555						5560					5565			
Gly	Arg	Asp	Asp	Val	Val	Phe	Gly	Thr	Val	Leu	Leu	Gly	Arg	Leu
5570						5575					5580			
Gly	Ala	Gly	Ala	Arg	Ser	Gly	Arg	Ala	Leu	Gly	Pro	Phe	Ile	Asn
5585						5590					5595			
Thr	Leu	Pro	Val	Arg	Val	Arg	Leu	Ala	Ala	Ala	Gly	Ser	Arg	Glu
5600						5605					5610			
Thr	Leu	Ala	Gly	Leu	Arg	Ala	Gln	Leu	Ala	Glu	Leu	Ile	Gly	His
5615						5620					5625			
Glu	His	Ala	Pro	Leu	Thr	Leu	Ala	Gln	Ala	Ala	Ser	Gly	Val	Pro
5630						5635					5640			
Gly	Gly	Thr	Pro	Leu	Phe	Thr	Ser	Ile	Leu	Asn	Tyr	Arg	Gln	Gly
5645						5650					5655			
Pro	Pro	Ala	Gly	Asp	Asp	Thr	Gly	Asp	Glu	Glu	Ile	Glu	Gly	Ile
5660						5665					5670			
Glu	Leu	Leu	Ser	Thr	Glu	Glu	Arg	Ser	Asn	Tyr	Pro	Val	Ala	Val
5675						5680					5685			
Ser	Val	Asp	Asp	Asp	Gly	Ser	Gly	Phe	Arg	Leu	Thr	Val	Asp	Ala
5690						5695					5700			
Ala	Gln	Pro	Ala	Ala	Pro	Asp	Arg	Val	Ala	Glu	Leu	Leu	His	Thr
5705						5710					5715			
Cys	Leu	His	Arg	Leu	Thr	Asp	Ala	Leu	Ala	Gly	Thr	Pro	Asp	Val
5720						5725					5730			
Glu	Pro	Ala	Arg	Ile	Asp	Val	Leu	Gly	Glu	Ala	Glu	Arg	Arg	Glu
5735						5740					5745			
Val	Leu	Arg	Thr	Pro	Asn	Ala	Thr	Ala	Arg	Asp	Val	Ala	Ala	Ala
5750						5755					5760			
Thr	Leu	Pro	Ala	Ile	Val	Gly	Glu	Trp	Ala	Arg	Thr	Thr	Pro	Gly
5765						5770					5775			
Ala	Thr	Ala	Val	Thr	Ala	Glu	Asn	Asp	Arg	Leu	Thr	Tyr	Ala	Glu
5780						5785					5790			
Leu	Asp	Ala	Arg	Ala	Asn	Arg	Leu	Ala	Arg	Ser	Leu	Ile	Ala	Arg
5795						5800					5805			
Gly	Val	Gly	Pro	Gly	Ala	Val	Val	Gly	Met	Leu	Leu	Pro	Arg	Ser

5810	5815	5820
Pro Gly 5825	Leu Val Val Ala Met 5830	Leu Ala Ile Val Lys Ala Gly Gly 5835
Ala Tyr 5840	Leu Pro Leu Asp Pro 5845	Gly Tyr Pro Ala Pro Arg Leu Ala 5850
Arg Met 5855	Val Glu Asp Ala Ala 5860	Pro Ala Leu Leu Leu Ala Thr Ala 5865
Gly Thr 5870	Ala Asp Ala Val Pro 5875	Ala Gly Pro Gln Arg Leu Leu Leu 5880
Asp Asp 5885	Pro Gly Thr Ala Ala 5890	Glu Leu Ala Arg Leu Asp Gly Asp 5895
Pro Ile 5900	Arg Asp Glu Glu Arg 5905	Thr His Pro Leu Arg Pro Gly His 5910
Pro Ala 5915	Tyr Leu Met Phe Thr 5920	Ser Gly Ser Thr Gly Arg Pro Lys 5925
Gly Val 5930	Leu Val Pro His Ala 5935	Gly Ile Asp Arg Met Val Arg Arg 5940
Ser Thr 5945	Cys Leu Gln Leu Ala 5950	Pro Asp Asp Val Leu Pro His Leu 5955
Ser Ser 5960	Val Ser Phe Asp Ala 5965	Ala Thr Phe Glu Ile Trp Gly Ala 5970
Leu Leu 5975	Asn Gly Ala Thr Leu 5980	Ala Val Ala Pro Ala Glu Thr Leu 5985
Ser Val 5990	Ala Glu Leu Arg Ala 5995	Phe Leu Ala Asp Arg Gly Ala Thr 6000
Lys Leu 6005	Phe Leu Thr Thr Gly 6010	Leu Leu His Glu Val Ile Asp Ala 6015
Asp Val 6020	Thr Ala Leu Ala Gly 6025	Leu Lys Ala Val Tyr Thr Gly Gly 6030
Asp Val 6035	Leu Ser Pro Ala His 6040	Cys Arg Ser Leu Leu Asp Arg Val 6045
Pro Gly 6050	Leu Glu Leu Tyr Asn 6055	Ala Tyr Gly Pro Thr Glu Asn Thr 6060
Thr Ile 6065	Thr Thr Leu His Arg 6070	Val Arg Pro Glu Asp Leu Asp Ala 6075
Gly Thr 6080	Gly Val Pro Ile Gly 6085	Val Pro Ile Ser Asp Thr Arg Val 6090
Tyr Val 6095	Leu Asp Asp Ala Leu 6100	Arg Pro Val Pro Val Gly Val Ala 6105
Gly Glu 6110	Leu Tyr Thr Ser Gly 6115	Ile Gly Leu Ala His Gly Tyr Ala 6120

Gly	Arg	Pro	Ala	Pro	Thr	Ala	Glu	Arg	Phe	Val	Ala	Cys	Pro	Phe
6125						6130					6135			
Ala	Pro	Gly	Glu	Arg	Met	Tyr	Arg	Thr	Gly	Asp	Leu	Val	Arg	Trp
6140						6145					6150			
Thr	Ala	Asp	Gly	Arg	Leu	Leu	Phe	Ala	Gly	Arg	Ala	Asp	Asn	Gln
6155						6160					6165			
Val	Lys	Ile	Arg	Gly	Phe	Arg	Val	Glu	Pro	Gly	Glu	Leu	Glu	Thr
6170						6175					6180			
Val	Leu	Ser	Gly	His	Pro	Ala	Val	Ala	Arg	Ala	Ala	Val	Leu	Ala
6185						6190					6195			
Arg	Glu	Asp	Thr	Pro	Gly	Ala	Lys	Arg	Leu	Val	Ala	Tyr	Val	Val
6200						6205					6210			
Pro	Ala	Arg	Pro	Asp	Glu	Asp	Gly	Asp	Ala	Leu	Ala	Glu	Ser	Val
6215						6220					6225			
Arg	Ala	Tyr	Ala	Ala	Arg	Gln	Val	Pro	Asp	Tyr	Leu	Met	Pro	Ala
6230						6235					6240			
Ala	Thr	Val	Val	Leu	Pro	Asp	Leu	Pro	Leu	Thr	Ser	Ser	Gly	Lys
6245						6250					6255			
Val	Asp	Arg	Ala	Ala	Leu	Pro	Ala	Pro	Asp	Val	Pro	Gly	Gly	Pro
6260						6265					6270			
Gly	Arg	Ala	Ala	Gly	Thr	Leu	Thr	Glu	Glu	Ile	Leu	Cys	Gly	Val
6275						6280					6285			
Phe	Ala	Gln	Val	Leu	Gly	Leu	Pro	Thr	Val	Gly	Val	Asp	Asp	Asp
6290						6295					6300			
Phe	Phe	Ala	Ser	Gly	Gly	His	Ser	Leu	Leu	Ala	Thr	Arg	Leu	Val
6305						6310					6315			
Ser	Arg	Leu	Arg	Ala	Val	Phe	Gly	Ala	Glu	Leu	Pro	Ile	Arg	Ala
6320						6325					6330			
Val	Phe	Glu	Ala	Pro	Thr	Pro	Ala	Thr	Leu	Ala	Thr	Arg	Leu	Gly
6335						6340					6345			
Ala	Ser	Ala	Pro	Arg	Arg	Leu	Ala	Leu	Gly	Glu	Arg	Ala	Arg	Pro
6350						6355					6360			
Glu	Asn	Val	Pro	Leu	Ser	Tyr	Ala	Gln	Arg	Arg	Leu	Trp	Phe	Leu
6365						6370					6375			
Asp	Arg	Leu	Glu	Gly	Gln	Asp	Gly	Thr	Tyr	Thr	Ile	Pro	Leu	Thr
6380						6385					6390			
Val	Arg	Leu	Asp	Gly	Pro	Val	Asp	Arg	Ala	Ala	Leu	Ala	Ala	Ala
6395						6400					6405			
Leu	Arg	Asp	Val	Leu	Glu	Arg	His	Glu	Val	Leu	Arg	Thr	Val	Phe
6410						6415					6420			

Pro	Leu	Val	Asp	Gly	Glu	Pro	Val	Gln	Arg	Val	Leu	Pro	Val	His
6425						6430					6435			
Asp	Thr	Gly	Phe	Thr	Leu	Gly	Gly	Gly	Asp	Val	Ala	Ala	Ala	Asp
6440						6445					6450			
Leu	Gly	Ala	Ala	Val	Ala	Glu	Ala	Thr	Ala	Gly	Thr	Phe	Asp	Leu
6455						6460					6465			
Ala	Ala	Glu	Ile	Pro	Val	Arg	Ala	Trp	Leu	Phe	Arg	Ala	Gly	Pro
6470						6475					6480			
Glu	Asp	His	Thr	Leu	Val	Leu	Leu	Val	His	His	Val	Ala	Gly	Asp
6485						6490					6495			
Gly	Trp	Ser	Met	Thr	Pro	Leu	Ala	Arg	Asp	Ile	Ala	Thr	Ala	Tyr
6500						6505					6510			
Asp	Ser	Arg	Arg	Glu	Ser	Arg	Ala	Pro	Gln	Trp	Glu	Pro	Leu	Pro
6515						6520					6525			
Val	Gln	Tyr	Ala	Asp	Tyr	Ala	Leu	Trp	Gln	Arg	Glu	Leu	Leu	Gly
6530						6535					6540			
Ala	Glu	Asp	Asp	Pro	Glu	Ser	Leu	Leu	Ser	Arg	Gln	Leu	Ala	Tyr
6545						6550					6555			
Trp	Arg	Asp	Ala	Leu	Asp	Gly	Val	Pro	Glu	Glu	Leu	Asp	Leu	Pro
6560						6565					6570			
Ala	Asp	Arg	Pro	Arg	Pro	Ala	Glu	Ala	Thr	His	Arg	Gly	His	Glu
6575						6580					6585			
Val	Pro	Val	Arg	Val	Pro	Ala	Glu	Val	His	Arg	Arg	Leu	Ala	Glu
6590						6595					6600			
Leu	Ala	Arg	Ser	Glu	Gly	Val	Thr	Val	Phe	Met	Val	Leu	Gln	Ala
6605						6610					6615			
Ala	Phe	Gly	Thr	Leu	Leu	Ser	Arg	Leu	Gly	Ala	Gly	Ala	Asp	Ile
6620						6625					6630			
Pro	Ile	Gly	Thr	Ala	Val	Ala	Gly	Arg	Thr	Asp	Gln	Ala	Leu	Asp
6635						6640					6645			
Glu	Leu	Val	Gly	Phe	Phe	Val	Asn	Thr	Leu	Val	Ile	Arg	Ala	Asp
6650						6655					6660			
Leu	Ser	Gly	Asp	Pro	Thr	Phe	Arg	Glu	Leu	Leu	Gly	Arg	Val	Arg
6665						6670					6675			
Ala	Thr	Gly	Leu	Ser	Ala	Tyr	Glu	His	Gln	Asp	Val	Pro	Phe	Glu
6680						6685					6690			
Arg	Leu	Val	Glu	Val	Leu	Ala	Pro	Ala	Arg	Ser	Leu	Ala	Arg	His
6695						6700					6705			
Pro	Leu	Phe	Gln	Val	Met	Leu	Thr	Leu	Gln	Asn	Thr	Gly	Arg	Ala
6710						6715					6720			
Asp	Ala	Gly	Asp	Gln	Ala	Val	Pro	Pro	Ala	Ala	Gly	Ser	Ala	Ala

6725					6730					6735				
Ala	Lys	Phe	Asp	Leu	Glu	Ile	Ser	Ile	Ala	Glu	Thr	Phe	Ala	Ala
6740						6745					6750			
Asp	Gly	Glu	Pro	Ala	Gly	Leu	Ser	Gly	Val	Leu	Ile	Ala	Ala	Ala
6755						6760					6765			
Asp	Leu	Phe	Glu	Pro	Ala	Thr	Ala	Ala	Ala	Phe	Ala	Glu	Arg	Leu
6770						6775					6780			
Ala	Arg	Val	Leu	Ala	Ala	Ala	Gly	Ala	Asp	Pro	Arg	Leu	Arg	Val
6785						6790					6795			
Ser	Gln	Val	Asp	Ile	Leu	Ser	Ala	Glu	Glu	Arg	Glu	Ala	Val	Leu
6800						6805					6810			
Ser	Gly	Gly	Asn	Gly	Gly	Thr	Ala	Pro	Val	Pro	Val	Thr	Thr	Val
6815						6820					6825			
Pro	Ala	Leu	Phe	Ala	Glu	Gln	Ala	Arg	Arg	Thr	Pro	Gly	Ala	Val
6830						6835					6840			
Ala	Ala	Leu	Ser	Glu	Gly	Met	Ser	Leu	Thr	Tyr	Ala	Asp	Leu	Ala
6845						6850					6855			
Ala	Arg	Val	Asn	Arg	Leu	Ala	Arg	His	Leu	Val	Ser	Leu	Gly	Ala
6860						6865					6870			
Gly	Pro	Glu	Thr	Val	Val	Gly	Ile	Ala	Met	Ser	Arg	Gly	Leu	Asp
6875						6880					6885			
Met	Leu	Val	Ala	Val	Leu	Ala	Val	Gly	Gln	Ala	Gly	Ala	Ala	Tyr
6890						6895					6900			
Leu	Pro	Val	Asp	Pro	Ser	Tyr	Pro	Asp	Glu	Arg	Lys	Glu	Phe	Met
6905						6910					6915			
Leu	Thr	Asp	Ala	Gly	Ala	Ala	Tyr	Val	Leu	Thr	Leu	Ala	Ser	Asp
6920						6925					6930			
Ala	Asp	Arg	Val	Pro	Pro	Gly	Thr	Pro	Ala	Ala	Ala	Val	Val	Leu
6935						6940					6945			
Asp	Glu	Pro	Val	Thr	Ala	Ala	Arg	Ile	Ala	Gly	Leu	Asp	Pro	Ala
6950						6955					6960			
Asp	Leu	Thr	Asp	Ala	Asp	Arg	Val	Ala	Pro	Leu	Leu	Pro	Ala	His
6965						6970					6975			
Arg	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro	Lys
6980						6985					6990			
Gly	Val	Ala	Val	Glu	His	Arg	Thr	Val	Val	Asn	Leu	Leu	Ser	Trp
6995						7000					7005			
Ala	Ala	Gly	Arg	Phe	Gly	Gly	Ala	Asp	Phe	Ala	Arg	Thr	Leu	Ala
7010						7015					7020			
Ala	Thr	Ser	Leu	Asn	Phe	Asp	Val	Ser	Val	Phe	Glu	Ile	Phe	Gly
7025						7030					7035			

Pro	Leu	Val	Ser	Gly	Gly	Ser	Ile	Glu	Ile	Val	Thr	Asp	Leu	Leu
7040						7045					7050			
Ala	Leu	Ala	Asp	Pro	Ala	Ser	Pro	Ala	Trp	Glu	Ala	Ser	Leu	Val
7055						7060					7065			
Ser	Gly	Val	Pro	Ser	Ala	Phe	Ser	Arg	Val	Leu	Asp	Arg	Gly	Asp
7070						7075					7080			
Ile	Ala	Ala	Arg	Thr	Arg	Ser	Val	Val	Leu	Ala	Gly	Glu	Ala	Leu
7085						7090					7095			
Thr	Ala	Asp	Val	Val	Asn	Ala	Thr	Arg	Ala	Ala	Leu	Pro	Gly	Val
7100						7105					7110			
Arg	Val	Ala	Asn	Ile	Tyr	Gly	Pro	Thr	Glu	Ala	Thr	Val	Tyr	Ser
7115						7120					7125			
Thr	Ala	Trp	His	Thr	Asp	Arg	Asp	Val	Thr	Gly	Gly	Ala	Ala	Pro
7130						7135					7140			
Ile	Gly	Arg	Pro	Val	Thr	Asn	Thr	Arg	Ala	Tyr	Val	Leu	Asp	Asp
7145						7150					7155			
Arg	Leu	Thr	Pro	Val	Pro	Pro	Gly	Val	Val	Gly	Glu	Leu	Tyr	Leu
7160						7165					7170			
Ala	Gly	Ala	Gln	Leu	Ala	Arg	Gly	Tyr	Leu	Gly	Arg	Pro	Gly	Leu
7175						7180					7185			
Thr	Gly	Glu	Arg	Phe	Val	Ala	Cys	Pro	Phe	Gly	Pro	Gly	Gly	Glu
7190						7195					7200			
Arg	Met	Tyr	Arg	Thr	Gly	Asp	Arg	Val	Arg	Trp	Asn	Ala	Asp	Gly
7205						7210					7215			
Asp	Leu	Val	Phe	Ala	Gly	Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg
7220						7225					7230			
Gly	Phe	Arg	Ile	Glu	Pro	Gly	Glu	Val	Gln	Ala	Val	Val	Ala	Arg
7235						7240					7245			
Gln	Ala	Gly	Val	Ala	Arg	Ala	Val	Val	Leu	Ala	Arg	Ser	Asp	Ser
7250						7255					7260			
Pro	Gly	Asp	Ala	Arg	Leu	Val	Ala	Tyr	Val	Val	Pro	Ala	Asp	Arg
7265						7270					7275			
Asp	Ala	Asp	Arg	Arg	Ala	Leu	Ala	Ala	Thr	Val	Arg	Ser	Asp	Thr
7280						7285					7290			
Ala	Arg	Glu	Leu	Pro	Ala	Tyr	Leu	Val	Pro	Ala	Ala	Val	Val	Val
7295						7300					7305			
Leu	Asp	Glu	Leu	Pro	Val	Thr	Ala	Asn	Gly	Lys	Leu	Asp	Arg	Arg
7310						7315					7320			
Ala	Leu	Pro	Ala	Pro	Gly	Leu	Ala	Glu	Ala	Gly	Ser	Gly	Arg	Gly
7325						7330					7335			

Pro Val Thr His Arg Glu Glu Val Leu Cys Glu Val Phe Ala Gln	7340	7345	7350
Val Leu Gly Leu Pro Ser Val Gly Val Asp Asp Asp Phe Phe Ala	7355	7360	7365
Leu Gly Gly His Ser Leu Leu Ala Val Ser Leu Val Glu Gln Leu	7370	7375	7380
Arg Arg Arg Gly Val Thr Val Gly Val Arg Ala Leu Phe Gln Thr	7385	7390	7395
Pro Thr Val Ala Gly Leu Ala Glu Ala Ala Ala Pro Thr Thr Val	7400	7405	7410
Ala Val Pro Pro Asn Leu Ile Pro Glu Asp Ala Arg His Ile Thr	7415	7420	7425
Pro Gly Leu Leu Pro Leu Val Glu Leu Glu Gln Ala Glu Ile Asp	7430	7435	7440
Gln Val Val Ala Thr Val Asp Gly Gly Ala Ala Asn Val Ala Asp	7445	7450	7455
Ile Tyr Pro Leu Ala Pro Leu Gln Gln Gly Met Leu Phe His His	7460	7465	7470
Leu Met Ala Gly Asp Asp Gly Glu Asp Val Tyr Ile Met Pro Ala	7475	7480	7485
Val Val Glu Phe Asp Ser Ala Asp Arg Phe Gly Ala Phe Val Asp	7490	7495	7500
Ala Leu Gln His Val Ile Asp Arg Asn Asp Val Tyr Arg Thr Gly	7505	7510	7515
Val Val Trp Asp Gly Leu Arg Glu Pro Val Gln Val Val Trp Arg	7520	7525	7530
Arg Ala Pro Leu Pro Val Thr Glu Val Thr Leu Asp Pro Ala Gly	7535	7540	7545
Gly Asp Pro Ala Ala Gln Leu His Ala Ala Ala Gly Ala Arg Met	7550	7555	7560
Asp Leu Asn Arg Ala Pro Leu Leu Asp Leu His Val Ala Ala Arg	7565	7570	7575
Pro Glu Asp Gly Gln Arg Leu Ala Leu Leu Arg Val His His Met	7580	7585	7590
Val Gln Asp His Met Gly Leu Glu Val Leu Leu Gly Glu Val Gln	7595	7600	7605
Ala Phe Leu Ala Gly Arg Gly Asp Glu Leu Pro Asp Pro Leu Pro	7610	7615	7620
Phe Arg Asp Phe Val Ala Gln Thr Arg Gly Gly Val Pro Glu Ala	7625	7630	7635
Glu His Arg Arg Phe Phe Ala Gly Leu Leu Gly Asp Val Thr Glu			

7640		7645		7650
Pro Thr Ala Pro Tyr Gly Leu	Leu Asp Val His Arg	Asp Gly Val		
7655	7660	7665		
Gly Leu Val Arg Gln Glu Arg	Pro Leu Asp Gly Glu	Val Val Ala		
7670	7675	7680		
Arg Leu Arg Ala Val Ala Arg	Arg Leu Gly Val Ser	Pro Ala Thr		
7685	7690	7695		
Val Met His Val Ala Trp Ala	Arg Val Leu Gly Val	Ile Ser Gly		
7700	7705	7710		
Arg Asp Asp Val Val Phe Gly	Thr Leu Leu Leu Gly	Arg Phe Ser		
7715	7720	7725		
Thr Gly Ala Asp Arg Val Pro	Gly Pro Phe Ile Asn	Thr Leu Pro		
7730	7735	7740		
Val Arg Ala Arg Leu Gly Gly	Thr Gly Ala Ala Ala	Ala Val Ala		
7745	7750	7755		
Glu Met Arg Arg Leu Leu Ala	Glu Leu Leu Glu His	Glu His Ala		
7760	7765	7770		
Pro Leu Thr Thr Ala Gln Gln	Ala Ser Gly Leu Ser	Gly Asn Leu		
7775	7780	7785		
Pro Leu Phe Thr Ala Leu Phe	Asn Tyr Arg His Asn	Thr Ser Pro		
7790	7795	7800		
Gly Ala Asp Pro Ser Pro Ala	Ala Gly Pro Thr Glu	Gly Ile Arg		
7805	7810	7815		
Pro Val Ser Met Arg Glu Arg	Thr Asn Tyr Pro Ile	Ser Val Ala		
7820	7825	7830		
Val Asp Asp Asp Gly Glu Gly	Leu Gly Val Ala Val	Asn Ala Ile		
7835	7840	7845		
Pro Pro Val Arg Pro Glu Ala	Val Cys Glu Leu Val	Ala Thr Ala		
7850	7855	7860		
Thr Glu Ser Leu Thr Ser Ala	Leu Glu Leu Phe Leu	Asp Gly Gly		
7865	7870	7875		
Pro Asp Thr Ala Val Gly Glu	Leu Asp Val Leu Pro	Pro Gly Glu		
7880	7885	7890		
Arg Ser Arg Leu Leu Val Glu	Trp Asn Asp Thr Ala	Arg Pro Val		
7895	7900	7905		
Val Glu Ser Ser Val Pro Ala	Leu Phe Ala Glu Arg	Val Ala Ala		
7910	7915	7920		
Ala Pro Asp Ala Val Ala Val	Val Gly Glu Gly Val	Ser Trp Ser		
7925	7930	7935		
Tyr Arg Glu Leu Asp Arg Arg	Ser Asp Val Leu Ala	Arg Ser Leu		
7940	7945	7950		

Val	Ala	Ala	Gly	Val	Gly	Leu	Glu	Ser	Pro	Val	Val	Val	Ala	Leu
7955						7960					7965			
Glu	Arg	Ser	Ala	Asp	Val	Leu	Thr	Ala	Phe	Leu	Ala	Val	Ala	Lys
7970						7975					7980			
Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp	Pro	Gln	Thr
7985						7990					7995			
Arg	Ile	Asp	Ala	Val	Ile	Ala	Asp	Ser	Arg	Pro	Val	Leu	Val	Leu
8000						8005					8010			
Asp	Ser	Val	Asp	Leu	Pro	Ala	Ala	Glu	Ala	Asp	Leu	Pro	Arg	Val
8015						8020					8025			
Pro	Ala	Gly	Ala	Gly	Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr
8030						8035					8040			
Gly	Arg	Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp
8045						8050					8055			
Leu	Ala	Thr	Asp	Thr	Cys	Trp	Gly	Ser	Thr	Pro	Arg	Val	Leu	Phe
8060						8065					8070			
His	Ala	Pro	His	Ala	Phe	Asp	Ala	Ser	Ser	Tyr	Glu	Ile	Trp	Val
8075						8080					8085			
Pro	Leu	Leu	Asn	Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Arg	Arg	Ser
8090						8095					8100			
Ile	Asp	Ala	Thr	Val	Leu	Arg	Asp	Leu	Val	Arg	Gly	His	Glu	Leu
8105						8110					8115			
Thr	His	Val	His	Val	Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Asp	Pro
8120						8125					8130			
Ser	Cys	Phe	Ala	Gly	Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly	Asp	Ala
8135						8140					8145			
Val	Ser	Ala	Glu	Ala	Val	Arg	Arg	Val	Lys	Glu	Ala	Asn	Pro	Gly
8150						8155					8160			
Leu	Arg	Val	Arg	Gln	Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr	Leu	Cys
8165						8170					8175			
Ala	Thr	Gln	His	Leu	Leu	Asp	Asp	Gly	Val	Pro	Ile	Gly	Arg	Pro
8180						8185					8190			
Leu	Asp	Asn	Thr	Arg	Val	Tyr	Val	Leu	Asp	Asp	Leu	Leu	Arg	Pro
8195						8200					8205			
Val	Pro	Thr	Gly	Val	Val	Gly	Glu	Leu	Tyr	Val	Ala	Gly	Ser	Gly
8210						8215					8220			
Leu	Ala	Arg	Gly	Tyr	Ala	Gly	Met	Pro	Gly	Leu	Thr	Ala	Glu	Arg
8225						8230					8235			
Phe	Val	Ala	Asp	Pro	Phe	Ser	Val	Gly	Gly	Arg	Leu	Tyr	Arg	Thr
8240						8245					8250			

Gly	Asp	Leu	Val	Arg	Trp	Thr	Asp	Asp	Gly	Val	Leu	His	Phe	Ala
8255						8260					8265			
Gly	Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg	Gly	Tyr	Arg	Val	Glu
8270						8275					8280			
Pro	Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Gln	His	Pro	Asp	Val	Ser
8285						8290					8295			
Gln	Val	Ala	Val	Val	Val	Arg	Glu	Asp	Ala	Pro	Gly	Asp	Lys	Arg
8300						8305					8310			
Leu	Val	Ala	Tyr	Val	Val	Gly	Gly	Asp	Val	Glu	Ala	Tyr	Ala	Gln
8315						8320					8325			
Glu	Arg	Leu	Pro	Gly	Tyr	Met	Val	Pro	Ser	Ala	Phe	Val	His	Leu
8330						8335					8340			
Glu	Ala	Leu	Pro	Leu	Thr	Ala	Asn	Gln	Lys	Val	Asp	Arg	Ala	Ala
8345						8350					8355			
Leu	Pro	Ala	Pro	Glu	Arg	Glu	Thr	Thr	Thr	Pro	Gly	Lys	Ala	Pro
8360						8365					8370			
Ala	Pro	Gly	Pro	Leu	Gly	Asn	Leu	Glu	Glu	Ser	Met	Cys	Gln	Ala
8375						8380					8385			
Phe	Ala	Glu	Val	Leu	Gly	Leu	Asp	Ser	Val	Gly	Pro	Asp	Asp	Asp
8390						8395					8400			
Phe	Phe	Ala	Leu	Gly	Gly	His	Ser	Leu	Leu	Ala	Val	Ala	Leu	Val
8405						8410					8415			
Gln	Arg	Leu	Lys	Ala	Arg	Gly	Val	Ala	Val	Thr	Val	Gln	Asp	Ile
8420						8425					8430			
Met	Ala	Ala	Pro	Thr	Val	Ser	Glu	Leu	Met	Gly	Ser	Leu	Ser	Met
8435						8440					8445			
Ser	Ser	Ile	Arg	Asp	Ser	Leu	Gly	Thr	Leu	Leu	Pro	Ile	Arg	Arg
8450						8455					8460			
Thr	Gly	Glu	Leu	Pro	Pro	Leu	Phe	Cys	Val	His	Pro	Ala	Gly	Gly
8465						8470					8475			
Leu	Ser	Trp	Cys	Tyr	Leu	Pro	Leu	Ala	Arg	His	Val	Pro	Ala	Asp
8480						8485					8490			
Arg	Pro	Ile	Tyr	Gly	Leu	Gln	Ala	Arg	Gly	Ala	Asp	Gly	Arg	Glu
8495						8500					8505			
Pro	Leu	Ala	Pro	Ser	Leu	Arg	Glu	Met	Ala	Ala	Asp	Tyr	Val	Ser
8510						8515					8520			
Arg	Met	Arg	Ala	Val	Gln	Pro	Glu	Gly	Pro	Tyr	His	Val	Leu	Gly
8525						8530					8535			
Phe	Ser	Phe	Gly	Val	Ala	Pro	Ala	His	Glu	Ile	Ala	Val	Gln	Leu
8540						8545					8550			
Arg	Glu	Gln	Gly	Ala	Glu	Val	Val	Leu	Val	Leu	Met	Asp	Ser	Tyr

8555	8560	8565
Pro Met Glu Asp Ala Glu Ser Gly Glu Gln Ala Ala Asp Glu Glu		
8570	8575	8580
Glu Leu Pro Trp Glu Glu Leu Ile Glu Ala Glu Phe Gly Arg Val		
8585	8590	8595
Leu Gly Gly Phe Ser Arg Asp Glu Leu Ala Ala Phe Ala Ala Val		
8600	8605	8610
Phe Arg Asn Asn Thr Lys Ile Arg Ala Arg His Arg Leu Gly Arg		
8615	8620	8625
Phe Asp Gly Asp Ala Leu Leu Ile Ala Ser Thr Asp Ser Ala Pro		
8630	8635	8640
Asp Gly Glu Ser Asn Thr Trp Arg Trp Ala Pro Tyr Ile Thr Gly		
8645	8650	8655
Glu Ile Thr Gln Val Val Leu Pro Cys Glu His Thr Asp Leu Val		
8660	8665	8670
Arg Pro Asp Met Leu Ala Leu Leu Trp Pro Ala Val Glu Ala Trp		
8675	8680	8685
Gln Ala Gly Arg His Arg Pro		
8690	8695	

<210> 16
 <211> 234
 <212> PRT
 <213> Actinoplanes sp.
 <400> 16

Met Gln Lys Ile Pro Leu Val Cys Val Pro Phe Ala Gly Ala Gly Ala	
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Ser Phe Phe His Pro Trp Ala Glu Leu Ala Gly Pro Asp Arg Pro Ile	
20 25 30	
Val Ala Leu Gln Leu Pro Gly Arg Glu Trp Arg Leu Leu Asp Glu Pro	
35 40 45	
Tyr Ala Asp Val Val Ala Ala Ala Asp Leu Ala Leu Thr Val Ala	
50 55 60	
Asp Glu Val Gly Ala Gly Gly Arg Val Ala Leu Phe Gly His Ser Leu	
65 70 75 80	
Gly Ala Val Leu Ala Tyr Glu Ile Ala His Ala Leu Val Arg Asp Gly	
85 90 95	
Glu Val Gly Val Glu Arg Leu Phe Val Ser Gly Ser Pro Asp Pro Trp	
100 105 110	
Thr Pro Arg Thr Asn Arg Ala Ser Gly Leu Asp Asp Glu Glu Phe Leu	
115 120 125	
Leu Arg Val Arg Glu Phe Ala Gly Tyr Asp His Glu Ala Leu Ala Asp	

130 135 140
 Pro Asp Met Arg Glu Leu Ile Leu Pro Ala Leu Arg Ala Asp Val Glu
 145 150 155 160
 Met His Glu Ser Tyr Val Ala Gly Ser Ala Asp Pro Leu Pro Ala Pro
 165 170 175
 Val Thr Ala Leu His Ala Arg Asp Asp Ala Leu Val Ser Ala Glu Gln
 180 185 190
 Thr Ala Gly Trp Ser Lys Ala Thr Ser Gly Pro Phe Gln Leu Val Glu
 195 200 205
 Val Asp Gly Gly His Met Tyr Leu Thr Glu Asp Pro Ala Gly Leu Leu
 210 215 220
 Arg Leu Ile Ala Ala Asp Leu Asp Arg Asp
 225 230

 <210> 17
 <211> 274
 <212> PRT
 <213> Actinoplanes sp.

 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue at
 this position

 <400> 17

 Val Arg Leu Thr Gly Lys Thr Ala Ile Val Thr Gly Ala Ala Arg Gly
 1 5 10 15
 Leu Gly Arg Ala Cys Ala Val Ala Phe Ala Ala Glu Gly Ala Asp Leu
 20 25 30
 Val Leu Leu Asp Arg Ala Ala Asp Leu Pro Gly Val Pro Tyr Pro Leu
 35 40 45
 Gly Thr Val Gly Gln Leu Glu His Thr Ala Asp Leu Cys Arg Lys Gln
 50 55 60
 Gly Ala Ala Val Leu Thr Val Arg Ala Asp Val Arg Asp Leu Ala Ala
 65 70 75 80
 Leu Thr Ala Ala Ala Asp Arg Ala Ile Asp Arg Phe Gly Gly Ile Asp
 85 90 95
 Val Leu Val Asn Asn Ala Gly Ile Ala Ala Pro Ser Gly Lys Val Thr
 100 105 110
 His Glu Ile Thr Glu Asp Glu Trp Gln Leu Met Ile Asp Val Asp Leu
 115 120 125
 Ser Gly Ala Trp Arg Met Thr Ala Ala Val Gly Arg His Met Thr Glu
 130 135 140

Arg Arg Ser Gly Ser Ile Val Asn Ile Ala Ser Thr Ala Gly Gln Val
 145 150 155 160
 Gly Tyr Arg His Phe Ala Gly Tyr Val Ala Ala Lys His Gly Ile Val
 165 170 175
 Gly Leu Thr Arg Ala Ala Ala Leu Asp Tyr Ala Pro Ala Lys Val Arg
 180 185 190
 Val Asn Ala Val Cys Pro Gly Ser Val Arg Asp Asp Pro Gln Phe Glu
 195 200 205
 Gly Arg Met Leu Ser Glu Ile Ala Arg Ser Leu Asp Val Pro Val Ala
 210 215 220
 Glu His Glu Gln Thr Phe Leu Gln Ala Gln Pro Met Asn Ala Leu Ile
 225 230 235 240
 Glu Pro Asp Asp Val Ala Asn Ala Ala Ile Trp Leu Ala Ser Asp Glu
 245 250 255
 Ser Arg Gln Val Thr Gly Ser Val Val Thr Val Asp Gly Gly Phe Thr
 260 265 270

Thr Arg

<210> 18
 <211> 891
 <212> PRT
 <213> Actinoplanes sp.
 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V is a non-standard initiator codon. It is expected that the bio
 synthesized protein will have a formylmethionine residue at this
 position

<400> 18

Val Pro Lys Ser Gln Pro Ala Thr Arg Thr Ala Ala Pro Gly Ala Ala
 1 5 10 15
 Glu Cys His Ala Leu Ala Val Arg Leu Ala Gly Pro Ile Asp Pro Ala
 20 25 30
 Pro Ile Glu Arg Arg Leu Ala Ala Arg Met Pro Phe Trp His Glu His
 35 40 45
 Val Ala Ala Arg Pro Gly Asp Glu Ala Ala Leu Arg Arg Arg Glu Arg
 50 55 60
 Glu Leu Ala Arg Pro Val Pro Pro Glu Pro Gly Ala Arg Ala Val Leu
 65 70 75 80
 Leu Ala Tyr Ala Asp Gly Ser Ala Asp Leu Val Leu Val Ala Arg Arg
 85 90 95

Asp Arg Leu Asp Arg Asp Ala Leu Ile Ala Leu Ala Arg Pro Glu Arg
 100 105 110
 Ala Pro Arg Gly Arg Lys Pro Ala Glu Pro Asp Ala Pro Pro Pro Ser
 115 120 125
 Ala Ala Pro Ala Trp Gly Leu Gly Asp Gly Gly Pro Asp Asp Arg Trp
 130 135 140
 Ala Glu Leu Arg Val Pro Ala Arg Gly Pro Ala Asp Pro Ala Arg Trp
 145 150 155 160
 Pro Ala Ala Leu Ala Lys Val Leu Ala Arg Tyr Glu Pro Gly Ala Ala
 165 170 175
 Ala Gly Ser Gly Ala Ala Ala Gly Leu Gly Ala Ala Ala Gly Ser Gly
 180 185 190
 Val Ala Ala Gly Ser Ser Ala Ala Ser Gly Ser Gly Ala Ala Ala Val
 195 200 205
 Pro Gly Pro Val Ala Leu Ala Phe Asp Gly Asp Leu Ala Pro Pro Asp
 210 215 220
 Glu Tyr Val Pro Phe Leu Ala Pro Thr His Pro Leu Thr Val Gln Val
 225 230 235 240
 Ser Arg Thr Pro Gly Gly Gly Thr Glu Leu Arg Cys Arg His Arg Leu
 245 250 255
 Gly Ala Val Ser Pro Ala Ala Ala Glu Ala Phe Ala Arg Met Leu Ala
 260 265 270
 Ala Ala His Gly Glu Pro Pro Ala Asp Asp Gly Ala Thr Ala Glu Pro
 275 280 285
 Thr Pro Pro Ala Ala Pro Ala Pro Ala Pro Ala Pro Ala Pro Ala Pro
 290 295 300
 Pro Ala Ala Ala Arg Thr Leu Thr Gly Leu Phe Ala Glu Gln Val Ala
 305 310 315 320
 Ala Arg Pro Thr Ala Val Ala Val Ser Asp Asp Arg Gly Arg His Thr
 325 330 335
 Tyr Arg Glu Leu Asp Glu Trp Ser Gly Arg Leu Ala Arg Gly Leu Arg
 340 345 350
 Lys Ala Gly Val Arg Asp Gly Asp Ala Val Gly Val Cys Leu Asp Arg
 355 360 365
 Ser Ala Glu Leu Val Ala Val Leu Leu Ala Val Leu Lys Ala Gly Ala
 370 375 380
 Ala Tyr Val Pro Leu Asp Ala Ala Tyr Pro Ala Asp Arg Ile Ala Tyr
 385 390 395 400
 Thr Val Gly Asp Ala Gly Leu Ala Val Val Val Thr Thr Ser Ala Asp
 405 410 415
 Phe Pro Asp Val Asp Gly Val Arg Leu Leu Ala Pro Glu Ser Leu Ala

420					425					430					
Glu	Ala	Gly	Asp	Asp	Pro	Gly	Ile	Pro	Leu	Ala	Thr	Pro	Ala	Gly	Pro
		435					440					445			
Glu	Arg	Pro	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro
		450				455					460				
Lys	Gly	Val	Val	Val	Pro	His	Ala	Asn	Val	Ser	Ala	Leu	Leu	Asp	Ala
465					470					475					480
Thr	Arg	Glu	Glu	Tyr	Ala	Leu	Gly	Pro	Gly	Asp	Val	Trp	Thr	Phe	Phe
				485					490					495	
His	Ser	Ala	Ala	Phe	Asp	Phe	Ser	Val	Trp	Glu	Ile	Trp	Gly	Cys	Leu
			500					505					510		
Leu	Thr	Gly	Gly	His	Leu	Val	Val	Val	Pro	Tyr	Trp	Val	Ser	Arg	Ser
		515					520					525			
Pro	Glu	Gln	Phe	His	Asp	Leu	Leu	Ala	Glu	Arg	Gly	Val	Thr	Val	Leu
		530				535					540				
Asn	Gln	Thr	Pro	Ser	Ser	Phe	Thr	Gln	Leu	Val	Ala	Ala	Asp	Arg	Gly
545					550					555					560
Ala	Glu	Arg	Asp	Leu	Ala	Val	Arg	Leu	Val	Ile	Phe	Gly	Gly	Glu	Pro
			565					570						575	
Leu	Asp	Ala	Arg	Thr	Val	Leu	Pro	Trp	Leu	Asp	Arg	Arg	Pro	Glu	Ala
			580					585					590		
Arg	Cys	Arg	Leu	Val	Asn	Met	Phe	Gly	Ile	Thr	Glu	Thr	Thr	Val	His
		595					600					605			
Val	Thr	Ala	Val	Asp	Val	Thr	Arg	Ala	Ala	Ala	Leu	Ala	Gly	Ser	Arg
		610				615					620				
Ser	Val	Gly	Arg	Pro	Leu	Pro	Gly	Trp	Ala	Val	Arg	Val	Leu	Asp	Glu
625					630				635						640
Gln	Arg	Arg	Glu	Val	Pro	Pro	Gly	Val	Pro	Gly	Glu	Ile	Tyr	Val	Gly
			645					650						655	
Gly	Ala	Gly	Val	Ala	Ile	Gly	Tyr	Leu	Asn	Arg	Pro	Glu	Leu	Thr	Ala
			660					665					670		
Glu	Arg	Phe	Val	Thr	Gly	Pro	Asp	Gly	Arg	Arg	Trp	Tyr	Arg	Ser	Gly
		675					680					685			
Asp	Arg	Gly	Arg	Leu	Leu	Pro	Asp	Gly	Thr	Leu	Glu	His	Leu	Gly	Arg
		690				695					700				
Leu	Asp	Asp	Gln	Val	Lys	Leu	Arg	Gly	Phe	Arg	Ile	Glu	Leu	Asp	Glu
705					710				715						720
Ile	Arg	Gly	Val	Leu	Thr	Glu	Cys	Ala	Gly	Val	Ala	Ala	Ala	Ala	Val
			725					730						735	
Val	Ile	Arg	Arg	Ser	Thr	Pro	Asp	Asp	Pro	Ala	Thr	Ala	Arg	Leu	Asp
			740					745						750	

Ala Tyr Val Val Ala Glu Ala Gly Ala Thr Pro Pro Val Ala Glu His
755 760 765

Ala Ala Arg Met Leu Pro Ala Tyr Met Cys Pro Ala Thr Phe Thr Phe
770 775 780

Leu Asp Ala Leu Pro Met Thr Pro Asn Gly Lys Val Asp Lys Ala Ala
785 790 795 800

Leu Pro Glu Pro Ala Arg Pro Ala Ala Asp Ala Ala Ala Thr Pro Ala
805 810 815

Gly Pro Gly Glu Asp Gly Leu Ala Gly Asp Leu Ala Asp Val Trp Gln
820 825 830

Gln Val Phe Gly Cys Pro Val Thr Val Ser Asp Asn Phe Phe Asp Leu
835 840 845

Gly Gly Asn Ser Leu Leu Ala Val Arg Met Ala Ala Leu Met Arg Arg
850 855 860

Arg Gly Leu Pro Arg Leu His Pro Arg Thr Leu Tyr Leu His Pro Thr
865 870 875 880

Val Arg Gly Leu Ala Asp Ala Leu Arg Ser Ala
885 890

<210> 19

<211> 187

<212> PRT

<213> Actinoplanes sp.

<400> 19

Met Arg Asn Leu Arg Arg Thr Thr Gly Ile Gly Leu Leu Ala Leu Leu
1 5 10 15

Ser Val Ala Ala Cys Ser Ser Thr Pro Ala Ala Ser Glu Pro Pro Pro
20 25 30

Ser Ala Ala Pro Pro Ser Ala Val Thr Ala Thr Gly Pro Ala Ala Glu
35 40 45

Lys Ala Val Lys Ser Gly Thr Gln Thr Tyr His Gln Ala Leu Asp Ala
50 55 60

Phe Val Ala Ala Ser Asn Lys Gly Thr Thr Asp Thr Thr Glu Ile Gly
65 70 75 80

Lys Tyr Ala Ser Gly Arg Ala Leu Met Thr Phe Gln Gly Ile Leu Ala
85 90 95

Ser Tyr Gln Gln Gln Gly Val His Thr Ser Gly Glu Pro Arg Ile Asp
100 105 110

Glu Pro Val Val Thr Gly Leu Thr Pro Pro Ala Asp Pro Thr Gly Val
115 120 125

Gln Leu Arg Gly Cys Ile Asp Ile Ser Ala Trp Pro Leu Thr Lys Ala
130 135 140

Asp Gly Thr Pro Ala Asp Lys Val Gly Gly Gln Gln Gly Ser Gly Pro
 145 150 155 160

Ser Ala Ile Leu Ala Asn Val Ala Arg Ser Gly Ala Thr Trp Gln Val
 165 170 175

Thr Glu Leu Ala Ile Gln Gly Pro Cys Ala Ala
 180 185

<210> 20
 <211> 415
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 20

Val Thr Val Arg Arg Trp Leu Pro Ala Gly Leu Thr Val Leu Ala Phe
 1 5 10 15

Ala Ala Gly Phe Trp Gln Lys Leu Pro Cys Gln Ala Ala Gly Trp Pro
 20 25 30

Asp Asp Thr Ala Thr Leu Phe Gly Arg Tyr Cys Tyr Ser Asp Val Pro
 35 40 45

Ile Leu Phe Arg Glu Arg Gly Leu Phe Asp Gly Ile Phe Pro Tyr Glu
 50 55 60

Ser Gly Pro Gly Ala Gln Pro Leu Glu Tyr Pro Val Leu Thr Gly Tyr
 65 70 75 80

Leu Met Asp Ala Thr Ala Arg Leu Val Arg Ala Ile Leu Pro Gly Ala
 85 90 95

Asp Val Ala Val Ala Ser Arg Ala Tyr Phe Leu Thr Thr Val Leu Val
 100 105 110

Leu Leu Ala Leu Ala Val Leu Thr Val Trp Ala Thr Gly Ala Val Leu
 115 120 125

Arg Arg Thr Gly Gly Arg Pro Gly Asp Ala Leu Leu Val Ala Ala Ala
 130 135 140

Pro Val Leu Ile Leu Ala Gly Thr Val Asn Trp Asp Leu Leu Ala Val
 145 150 155 160

Ala Ala Ala Val Leu Ala Ile Leu Ala Trp Glu Arg Asp Arg Pro Leu
 165 170 175

Leu Ala Gly Val Leu Ile Gly Leu Gly Thr Ala Ala Lys Leu Phe Pro
 180 185 190

Leu Val Leu Leu Gly Pro Val Leu Leu Leu Cys Leu Arg Gln Arg Arg
 195 200 205
 Met Arg Arg Phe Ala Arg Val Ala Ala Gly Ala Ala Gly Ala Trp Leu
 210 215 220
 Leu Val Asn Leu Pro Val Val Ala Leu Gln Pro Asp Gly Trp Met Glu
 225 230 235 240
 Phe Trp Arg Phe Asn Ala Gly Arg Gly Ala Glu Phe Gly Ser Leu Trp
 245 250 255
 Phe Ala Leu Asp Gly Leu Gly Leu His Met Pro Ala Val Asn Ala Val
 260 265 270
 Ala Leu Ala Thr Phe Gly Val Leu Leu Ala Gly Ile Ala Val Leu Ala
 275 280 285
 Leu Arg Ser Arg Arg Pro Pro Asp Leu Ala Gln Leu Ala Cys Leu Ala
 290 295 300
 Val Gly Ala Phe Leu Leu Thr Asn Lys Val Tyr Ser Pro Gln Tyr Ala
 305 310 315 320
 Leu Trp Leu Leu Pro Leu Val Val Ile Ala Arg Gly Arg Val Pro Arg
 325 330 335
 Trp Pro Val Val Arg Asp Trp Ala Val Trp Gln Ala Ala Glu Val Leu
 340 345 350
 Tyr Trp Leu Ala Val Trp Ser Trp Leu Ala Gly Ser Leu Thr Asp Glu
 355 360 365
 Arg Gln Tyr Ala Trp Ala Thr Val Leu Arg Val Leu Ala Thr Ala Tyr
 370 375 380
 Val Cys Gly Gln Val Val Trp Asp Val Leu Ala Ala Pro Arg Pro His
 385 390 395 400
 Arg Pro Ala Pro Pro Pro Ala Val Ala Glu Pro Ala His Pro Gly
 405 410 415

<210> 21
 <211> 491
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 21

Val Ala Ala Gln Pro Glu Glu Phe Asp Val Ile Val Val Gly Gly Gly
 1 5 10 15
 Pro Gly Gly Ser Thr Ala Ala Ala Leu Thr Ala Lys Gln Gly Ala Lys

20	25	30
Val Leu Leu Leu Glu Arg Glu Lys Phe Pro Arg Tyr Gln Ile Gly Glu		
35	40	45
Ser Leu Leu Pro Ser Thr Val His Gly Val Cys Asn Leu Leu Gly Val		
50	55	60
Gly Asp Glu Ile Ala Lys Ala Gly Phe Met Arg Lys His Gly Gly Thr		
65	70	75
Phe Lys Trp Gly Thr Ser Thr Glu Pro Trp Thr Phe Thr Phe Ala Thr		
85	90	95
Ser Pro Arg Met Ala Gly Pro Thr Ser His Ala Phe Gln Val Glu Arg		
100	105	110
Arg Arg Phe Asp Gln Ile Leu Leu Glu Asn Ala Arg Arg Leu Gly Val		
115	120	125
Asp Val Arg Glu Asn His Pro Val Thr Glu Ala Ile Ala Asp Asp Glu		
130	135	140
Arg Val Arg Gly Val Arg Phe Thr Gln Asp Gly Gln Thr Arg Thr Ala		
145	150	155
Leu Ala Arg Phe Val Val Asp Ala Ser Gly Asn Arg Ser Thr Leu His		
165	170	175
Thr Thr Val Gly Gly Thr Arg Glu Tyr Ser Pro Phe Phe Arg Asn Leu		
180	185	190
Ala Leu Phe Gly Tyr Phe Glu Asn Gly Arg Arg Leu Pro Ala Pro Asn		
195	200	205
Ser Gly Asn Ile Leu Cys Val Ala Phe Gly Ser Gly Trp Phe Trp Tyr		
210	215	220
Ile Pro Leu Ser Glu Thr Leu Thr Ser Val Gly Ala Val Val Arg Arg		
225	230	235
Glu Met Ala His Lys Val Gln Gly Asp Gln Glu Lys Ala Leu Phe Glu		
245	250	255
Leu Ile Ala Glu Cys Pro Met Ile Ala Asp Phe Leu Gly Asp Ala Thr		
260	265	270
Arg Val Thr Glu Gly Asp Tyr Gly Gln Ile Arg Val Arg Lys Asp Tyr		
275	280	285
Ser Tyr Ser Ser Thr Ser Tyr Trp Arg Pro Gly Met Cys Leu Val Gly		
290	295	300
Asp Ala Ala Cys Phe Ile Asp Pro Val Phe Ser Ser Gly Val His Leu		
305	310	315
Ala Thr Tyr Ser Gly Leu Leu Ala Ala Arg Ser Ile Asn Ser Val Leu		
325	330	335
Ala Gly Thr Val Asp Glu Asp Arg Ala Phe Thr Glu Phe Glu Gln Arg		
340	345	350

Tyr Arg Arg Glu Phe Gly Val Phe His Asp Phe Leu Val Ser Phe Tyr
 355 360 365
 Asp Met His Val Asp Glu Ser Ser Tyr Phe Trp Ala Ala Arg Lys Val
 370 375 380
 Thr Glu Ser Ser Ala Pro Ala Met Glu Ser Phe Thr Glu Leu Val Gly
 385 390 395 400
 Gly Ile Ala Ser Gly Glu Asp Ala Leu Thr Gly Ser Thr Glu Leu Val
 405 410 415
 Arg Arg His Ser Arg Gln Thr Ala Glu Leu Gly Gln Ala Val Ala Gly
 420 425 430
 Leu Glu Glu Gly Gly Thr Gly Phe Leu Arg Gly Ser Ser Val Val Ala
 435 440 445
 Gln Ala Met Phe Glu Gly Ser Gln Ile Gln Ala Gly Ala Ile Leu Gly
 450 455 460
 Pro Glu Gly Thr Gln Glu Gln Pro Leu Phe Glu Gly Gly Leu Thr Pro
 465 470 475 480
 Ser Gly Asn Gly Leu Thr Trp Val Ala Ala Asp
 485 490

<210> 22
 <211> 217
 <212> PRT
 <213> Actinoplanes sp.

<400> 22

Met Thr Ile Arg Val Leu Ile Ala Asp Asp Gln Ala Met Ile Arg Ser
 1 5 10 15
 Gly Leu Arg Leu Ile Leu Glu Asp Glu Pro Asp Ile Glu Val Val Ala
 20 25 30
 Glu Ala Val Asp Gly Val Asp Ala Val Ala Gln Ala Arg Lys Leu Arg
 35 40 45
 Pro Asp Val Cys Leu Val Asp Ile Arg Met Pro Arg Ile Asp Gly Ile
 50 55 60
 Glu Val Thr Arg Ser Leu Ala Gly Pro Gly Val Val Asn Pro Leu Arg
 65 70 75 80
 Val Ile Val Val Thr Thr Phe Asp Ser Asp Glu Tyr Val Tyr Gly Ala
 85 90 95
 Leu Arg Gly Gly Ala Val Gly Phe Ile Leu Lys Asp Ala Gly Pro Thr
 100 105 110
 Leu Leu Val Glu Ala Val Arg Ala Ala His Lys Gly Asp Ala Leu Val
 115 120 125
 Ser Pro Ser Val Thr Val Arg Leu Leu Asn His Leu Asn Ala Ser Ala
 130 135 140

Ala Pro Ala Gly Ser Glu Pro Ile Pro Leu Ser Asp Arg Glu Leu Glu
 145 150 155 160
 Val Ala Arg Ala Ile Ala Arg Gly Arg Thr Asn Gln Glu Ile Ala Ala
 165 170 175
 Asp Leu Phe Ile Ser Leu Ser Thr Val Lys Gly His Ala Ser Thr Ile
 180 185 190
 Gln Ser Lys Leu Gly Val Arg Asn Arg Val Gly Val Ala Ala Trp Ala
 195 200 205
 Trp Glu Asn Arg Leu Val Glu Gly Ser
 210 215
 <210> 23
 <211> 403
 <212> PRT
 <213> Actinoplanes sp.
 <400> 23
 Met Asn Ile Ala Ala Ala Thr Gly Pro Ala Ala Gly Asp Gly Ala Gly
 1 5 10 15
 Ile Arg Thr Leu Gly Ser Val Arg Thr Ala Asp Arg Thr Thr Thr Met
 20 25 30
 Val Ala Asp Ala Gly Leu Ala Val Leu Phe Val Ala Ala Val Val Val
 35 40 45
 Glu Ala Val Ala Val Ala Gln Ser Trp Gly Leu Ala Tyr Trp Leu Ile
 50 55 60
 Gly Gly Ala Ala Ala Thr Leu Val Cys Leu Leu Ala Leu Ile Arg Arg
 65 70 75 80
 Arg Gly Pro Val Pro Cys Ala Ala Ala Gly Leu Thr Ile Ala Ala Gly
 85 90 95
 Ala Val Val Thr Ala Ala Val Leu His Met Pro Ala Glu Pro Gly Pro
 100 105 110
 Ala Met Ala Leu Ala Leu Ala Val Leu Thr Gly Ser Ala Val Arg Ala
 115 120 125
 Ala Pro Thr Ile Pro Ala Phe Ala Val Gly Gly Ala Ala Leu Gly Val
 130 135 140
 Val Ala Leu Ser Gln Val Ala Ala Ala Thr Trp Asp Ala Gly Pro Ala
 145 150 155 160
 Pro Val Thr Trp Leu Asn Ile Leu Thr Trp Leu Gly Gly Thr Ala Thr
 165 170 175
 Gly Leu Ser Leu Arg Thr Val Asp Gly Arg Ala Arg Ala Asn Ala Glu
 180 185 190
 Arg Ile Arg Gln Glu Glu Arg Leu Glu Leu Ala Arg Glu Leu His Asp
 195 200 205

Val Val Ala His His Ile Thr Gly Met Ile Leu Gln Thr Gln Ala Ala
210 215 220

Gln Val Leu Ala Arg Arg Asp Ala Gly Arg Val Pro Glu Arg Leu Ala
225 230 235 240

Val Ile Glu Thr Ala Gly Thr Glu Ala Leu Ala Ala Met Arg Arg Val
245 250 255

Val Gly Leu Leu Arg Asp Ala Asp Asp Gly Pro Pro Ser Ala Pro Glu
260 265 270

Pro Glu Glu Leu Ser Thr Leu Val Glu Arg Phe Ser Arg Gln Gly Gly
275 280 285

Pro Val Arg Leu Thr Thr Pro Asp Gly Met Lys Gln Trp Pro Ile Glu
290 295 300

Val Thr Thr Thr Val Tyr Arg Ile Val Arg Glu Ala Leu Thr Asn Val
305 310 315 320

Ala Arg His Ala Pro His Ala Pro Asn Val Thr Val Thr Val Thr Val
325 330 335

Glu Gln Ala Asp Glu Ile Arg Val Glu Val Thr Asn Asp Ala Ala Ala
340 345 350

Ala Pro Pro Arg Leu His His Arg Gly Gly Tyr Gly Leu Val Gly Met
355 360 365

Arg Glu Arg Val Glu Ser Leu Gly Gly Thr Leu Ser Thr Gly Pro Arg
370 375 380

Pro Gly Gly Gly Trp Ser Val Ala Ala Thr Leu Pro Asn Pro Pro Arg
385 390 395 400

Glu Arg Arg

<210> 24

<211> 309

<212> PRT

<213> Actinoplanes sp.

<400> 24

Met Lys Ala Met Ser His Glu Arg Ser Thr Pro Val Leu Gln Ala Glu
1 5 10 15

Gly Leu Thr Lys Arg Tyr Gly Arg Arg Arg Ala Leu Thr Asp Cys Thr
20 25 30

Leu Ser Val Pro Ser Gly Arg Val Ile Ala Leu Val Gly Pro Arg Gly
35 40 45

Ser Gly Lys Ser Thr Leu Leu Gln Leu Cys Cys Gly Met Val Ala Pro
50 55 60

Ser Arg Gly Arg Ile Arg Val Leu Gly Glu Arg Pro Asp Ala Gly Ala
65 70 75 80

Ala His Leu Ala Arg Val Gly Tyr Val Pro Arg Glu Pro Ala Val Tyr
 85 90 95
 Gly Ser Phe Thr Val Glu Asp His Leu Thr Met Gly Ala Arg Leu Asn
 100 105 110
 Pro Arg Trp Asp Arg Arg Leu Ala Asp Arg Arg Ile Ala Ser Ala Gly
 115 120 125
 Ile Pro Arg Thr Arg Arg Ala Asp Arg Leu Ser Ala Gly Gln Arg Ala
 130 135 140
 Glu Leu Ala Leu Thr Leu Ala Gly Gly Lys Arg Pro Glu Leu Leu Val
 145 150 155 160
 Leu Asp Glu Pro Gly Ala Val Leu Asp Ala Pro Ala Arg Ala Ser Phe
 165 170 175
 Leu Arg Gly Val Leu Asp Phe Val Ala Glu Ile Asp Ala Ser Val Leu
 180 185 190
 Ile Ser Gly His Pro Ser Gly Glu Val Glu Arg Leu Cys Asp His Leu
 195 200 205
 Ile Val Leu Ser Asp Ser Arg Val Leu Val Ala Gly Asp Val Arg Asp
 210 215 220
 Leu Leu Ala Arg His His Arg Ile Ile Ala Pro Arg Gly Glu Leu Asp
 225 230 235 240
 Arg Leu Pro Pro Gly Met Glu Pro Ile Trp Val Glu Asp Phe Gly Ser
 245 250 255
 Tyr Ser Gly Gly Val Val Arg Ala Glu Val Asp Leu Pro Arg Arg Pro
 260 265 270
 Trp Thr Val Glu Arg Val Glu Leu Glu Glu Leu Val Leu Ser Tyr Leu
 275 280 285
 Ser Arg Ala Ser Gly Ala Pro Ala Leu Ala Gly Cys Leu Ile Ala Pro
 290 295 300

Gly Gln Pro Gly Ser
305

<210> 25
 <211> 553
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 25

Val Thr Ala Ala Ala Leu Glu Lys Leu Leu Gly Asp Ala Arg Asp Pro
1 5 10 15
Gly Asn Pro Val Gly Tyr Ala Ala Val Leu Ala Ala Asp Glu Arg Gln
20 25 30
Glu Met Leu Ala Glu Gly Glu Arg Leu Leu Asp Arg Tyr Gln Leu Asn
35 40 45
Ala Glu Phe Val Pro Val Ala Tyr Gly Gly Arg Leu Ala Arg Ala Asp
50 55 60
Arg Leu Ala Glu Val Leu Arg Ala Val Trp Arg Arg Asp Pro Cys Leu
65 70 75 80
Gly Leu Gly Tyr Gly Phe Ser Ser Leu Ile Ala Ser Val Asn Val Trp
85 90 95
Cys Ala Gly Asn Glu Glu Gln Arg Arg Arg Ala Ala Gly Leu Leu Leu
100 105 110
Ala Asn Lys Arg Ile Ala Ala Ala Phe His Glu Leu Ala His Gly Thr
115 120 125
Asp Phe Ser Ala Ala Glu Cys Ala Ala Arg Pro Ala Gly Gly Gly Trp
130 135 140
Val Leu Ser Gly His Lys Glu Ile Val Thr Asn Leu Arg Arg Ala Glu
145 150 155 160
Ala Met Val Leu Phe Ala Arg Thr Gly Glu Ala Arg Gly Ser Arg Ser
165 170 175
His Ser Gln Phe Leu Leu Val Arg Asp Glu Leu Pro Ala Ala Arg Ala
180 185 190
Val Asp Arg Pro Arg Tyr Pro Gly Ser Gly Met Arg Gly Ile Asp Leu
195 200 205
Gly Gly Leu Val Phe Asp Asp Cys Pro Val Pro Ser Ser Ala Leu Leu
210 215 220
Gly Glu Gln Gly His Gly Ile Glu Val Ala Leu Arg Ala Tyr Gln Val
225 230 235 240
Thr Arg Met Val Ser Pro Ala Leu Leu Val Gly Pro Leu Asp Ser Ala
245 250 255
Val Arg Leu Ala Thr Glu Met Ala Met Glu Arg Arg Leu Tyr Gly Ala
260 265 270
Ala Val Ala Asp Leu Pro Tyr Val Arg Thr Thr Ile Ala Arg Ala Tyr
275 280 285
Ala Ala Leu Leu Thr Val Asp Val Phe Ser Gly Val Gly Leu Arg Ala
290 295 300
Leu His Leu Leu Pro Glu Ala Thr Ala Gly Tyr Ala Pro Ala Val Lys
305 310 315 320
Tyr Leu Thr Ala Gln Ile Val Leu Asp Ala Ile Asp Asp Leu Arg Ser

325	330	335
Val Leu Gly Ala Gln Gly Tyr Leu Arg Gln Gly Pro Tyr Ala Met Phe		
340	345	350
Gln Lys Leu Val Arg Asp Ala Ala Pro Ala Ser Phe Ala His Val Ser		
355	360	365
Arg Ala Ala Cys Leu Val Met Leu Leu Pro His Leu Pro Arg Leu Ala		
370	375	380
Arg Arg Ser Trp Thr Ala Glu Glu Pro Pro Pro Asp Asn Val Phe Thr		
385	390	395
Leu Gly Gly Glu Leu Ser Pro Leu Asp Phe Ser Arg Leu Val Ser Gly		
405	410	415
Met Arg Gly Asp Pro Leu Ala Gly Val Leu His Asp Ser Trp His Asp		
420	425	430
Glu Gly Pro Val Gly Arg Phe Ala Glu Arg Phe His Arg Glu Leu Thr		
435	440	445
Gly Leu Arg Asp Ala Cys Arg Glu Leu Gly Pro Ala Asp Ile Thr Ile		
450	455	460
Asp Ala Asn Pro Ala Ala Phe Ala Leu Ala Asp Arg Tyr Thr Val Leu		
465	470	475
Leu Ala Ala Ala Cys Ala Leu Gly Val Trp Arg Ala Gly Gly Arg Leu		
485	490	495
His Arg Pro Ala Leu Leu Ala Val Leu Asp Gly Leu Ala Gly Arg Leu		
500	505	510
Gly Gly Glu Ala Val Leu Ser Val Ala Glu Arg Glu His Val Glu His		
515	520	525
Gln Leu Phe Glu Met Ala Ala Asp Arg Val Arg Thr Ser Arg Leu Leu		
530	535	540
Asp Leu Ser Ala Arg Gln Leu Pro Gly		
545	550	
<210> 26		
<211> 585		
<212> PRT		
<213> Actinoplanes sp.		
<400> 26		
Met Thr Val Arg Pro Leu Ala Pro Pro Ala Glu Val Arg Leu Asp Asp		
1	5	10
Leu Leu Gly Pro Glu Asp Ala Trp Asp Ala Glu Thr Ala Ala Arg Asp		
20	25	30
Ile Ala Glu Glu Phe Pro Ala Arg Leu His Asp Arg Leu Asn Ser Phe		
35	40	45
Gly Leu Gln Ser Trp Tyr Val Pro Pro Glu Trp Gly Gly Ala Pro Gly		

50					55					60					
Asp	His	Glu	Arg	Leu	Leu	His	Leu	Trp	Arg	Ala	Val	Ala	Arg	Arg	Asp
65					70					75					80
Leu	Ser	Ala	Ala	Val	Ala	His	Gly	Lys	Thr	Tyr	Leu	Gly	Ser	Ala	Pro
				85					90					95	
Val	Trp	Leu	Ala	Gly	Asp	Asp	Gly	Gln	Arg	Ala	Thr	Leu	Ala	Ala	Ala
			100					105					110		
Val	Leu	Ala	Gly	Thr	Pro	Val	Ala	Trp	Ala	Leu	Ser	Glu	Pro	Asp	His
		115					120					125			
Gly	Ala	Asp	Leu	Leu	His	Gly	Thr	Thr	Thr	Ala	Leu	Pro	His	Asp	Ala
		130				135						140			
Gly	Tyr	Arg	Leu	Arg	Gly	Leu	Lys	Trp	Pro	Ile	Asn	Asn	Ala	Thr	Arg
145					150					155					160
Ala	Arg	Tyr	Leu	Thr	Val	Leu	Ala	Arg	Thr	Gly	Arg	Ala	Gly	Asp	Ala
				165					170					175	
Arg	Gly	Gln	Ser	Leu	Phe	Leu	Val	Asp	Lys	Glu	Ala	Leu	Ala	Pro	Gly
			180					185					190		
Thr	Trp	Leu	Pro	Arg	Pro	Lys	Val	Ala	Thr	His	Gly	Val	Arg	Gly	Ile
		195					200					205			
Asp	Ile	Ser	Gly	Ile	Ala	Phe	Glu	Asp	Ala	Gly	Leu	Pro	Gly	Thr	Ala
	210					215					220				
Leu	Leu	Gly	Arg	Ala	Gly	Ser	Gly	Leu	Glu	Thr	Val	Leu	Arg	Ser	Leu
225					230					235					240
Gln	Leu	Thr	Arg	Thr	Met	Cys	Ala	Gly	Leu	Ser	Leu	Gly	Ala	Gly	Asp
				245					250					255	
Arg	Ala	Leu	Arg	Leu	Thr	Ala	Arg	Phe	Val	Ala	Gln	Arg	Met	Ile	Met
			260					265					270		
Arg	Arg	Pro	Leu	Leu	Asp	Arg	Gly	His	Pro	Ala	Gly	Ile	Leu	Ala	Arg
		275					280					285			
Cys	Ala	Ala	Leu	Leu	Ala	Ala	Glu	Ala	Thr	Ala	Val	Val	Gly	Thr	
	290					295					300				
Arg	Ser	Val	His	Ser	Leu	Thr	Ala	Glu	Met	Ser	Val	Thr	Ser	Ala	Ile
305					310					315					320
Val	Lys	Ala	Tyr	Val	Pro	Thr	Val	Val	Asp	Arg	Val	Leu	Arg	Glu	Leu
				325					330					335	
Ala	Glu	Leu	Leu	Gly	Ser	Arg	Ser	Phe	Leu	Arg	Asp	Glu	Tyr	Glu	His
			340					345					350		
Gly	Met	Phe	Pro	Lys	Leu	Val	Arg	Asp	His	His	Val	Val	Ala	Val	Phe
	355						360					365			
Asp	Gly	Ser	Thr	Pro	Val	Val	Arg	Thr	Ala	Leu	Ala	His	Gln	Phe	Pro
	370					375					380				

Arg Leu Ala Ala Gly Phe Ala Ala Gly Ala Val Ser Ala Glu Gly Leu
 385 390 395 400
 Ala Glu Ala Ser Ala Ala Gly Gln Pro Pro Pro Pro Leu Asp Arg Gly
 405 410 415
 Ala Leu Thr Leu Leu Ser Arg His Gly Cys Ser Val Val Gln Ala Leu
 420 425 430
 Pro Ala Leu Ala Val Ser Ala Ala Val Arg Gly Gly Pro Ala Gly Leu
 435 440 445
 Ala Arg His Ala Ala Ala Leu Ala Gly Glu Ala Arg Arg Ile Cys Gly
 450 455 460
 Gln Met Thr Glu Leu Gly Pro Ser Ala Arg Pro Ser Met Val Gly His
 465 470 475 480
 Glu Leu Ala Ala Ala Tyr Glu Trp Cys Tyr Ala Gly Ala Ala Cys Leu
 485 490 495
 Leu Leu Trp Thr Ser Ala Glu Gly Arg His Thr Ala Asp Pro Leu Trp
 500 505 510
 Ala Asp Gly Leu Trp Val Leu Ala Ala Leu Arg Ala Val Arg Arg Glu
 515 520 525
 Leu Ala Arg Val Leu Arg Ala Pro Ala Pro Asp Pro Gly Pro His Asp
 530 535 540
 Asp Gly Ala Asp Arg Leu Leu Ala Ala Arg Val Ala Ala Ala Ala Arg
 545 550 555 560
 Thr Gly Glu Pro Val Thr Pro Phe Gly Thr Ala Leu Arg Pro Pro Ala
 565 570 575
 Gly Thr Val Arg Ala Glu Asp Gly Arg
 580 585

<210> 27
 <211> 587
 <212> PRT
 <213> Actinoplanes sp.

<400> 27

Met Val Ile Asp Ala Ala Thr Gln Pro Thr Val Pro Asp Ala Phe Arg
 1 5 10 15
 Ala Gln Ala Ile Ala Arg Pro Gly Glu Pro Ala Leu Val Val Leu Pro
 20 25 30
 Gly Asp Pro Asp Ala Glu Pro Val Thr Leu Thr Tyr Ala Glu Leu Asp
 35 40 45
 Arg Arg Ala Ala Ala Arg Ala Ala Trp Leu Ala Ala Arg Phe Pro Ala
 50 55 60
 Gly Glu Arg Ile Leu Ile Ala Leu Pro Thr Gly Ala Glu Phe Val Glu
 65 70 75 80

Leu Tyr Leu Ala Cys Leu Tyr Ala Gly Leu Val Ala Val Pro Ala Pro
 85 90 95
 Pro Pro Gly Gly Ser Ser Gly Ala Ser Glu Arg Thr Val Gly Ile Ala
 100 105 110
 Ala Asp Cys Ser Pro Ala Leu Ala Val Val Asn Ala Asp Asp Ala Ala
 115 120 125
 Pro Leu Thr Ala Val Leu Arg Glu Arg Gly Leu Ser Gly Leu Pro Val
 130 135 140
 Gly Ala Leu Pro Pro Leu Ala Ala Glu Ala Ile Arg Pro Pro Arg Gly
 145 150 155 160
 Pro Arg Pro Asp Ser Leu Ala Val Leu Gln Tyr Ser Ser Gly Ser Thr
 165 170 175
 Gly Ser Pro Lys Gly Val Met Leu Ser His Arg Ala Val Leu Ala Asn
 180 185 190
 Leu Arg Ala Phe Asp Arg Ser Ser Gly His Asn Ser Asp Asp Val Phe
 195 200 205
 Gly Ser Trp Leu Pro Leu His His Asp Met Gly Leu Phe Ala Met Leu
 210 215 220
 Thr Ala Gly Leu Leu Asn Gly Ala Gly Val Val Leu Met Ser Pro Thr
 225 230 235 240
 Ala Phe Val Arg Arg Pro Ala Asp Trp Leu Arg Met Met Asp Arg Tyr
 245 250 255
 Arg Val Thr Ile Ser Ala Ala Pro Asn Phe Ala Tyr Asp Leu Cys Val
 260 265 270
 Arg Ala Val Arg Asp Glu Gln Ile Ala Gly Leu Asp Leu Ser Arg Ile
 275 280 285
 Arg Thr Leu Tyr Asn Gly Ser Glu Pro Val Asn Pro Ala Thr Val Arg
 290 295 300
 Ala Phe Thr Glu Arg Phe Ala Pro Phe Gly Leu His Thr His Ala Val
 305 310 315 320
 Asn Pro Cys Tyr Gly Met Ala Glu Phe Thr Ala Tyr Val Ser Thr Lys
 325 330 335
 Val Phe Glu Ala Pro Ala Val Phe Leu Pro Ala Asp Pro Arg Ala Leu
 340 345 350
 Glu Asp Ala Ala Ser Pro Ala Leu Arg Pro Ala Asp Pro Ala Ala Ala
 355 360 365
 Arg Glu Ile Pro Gly Val Gly Arg Val Pro Asp Phe Glu Val Leu Ile
 370 375 380
 Val Asp Pro Asp Gly Leu Arg Pro Leu Pro Glu Gly Arg Val Gly Glu
 385 390 395 400

ile Trp Leu Arg Gly Pro Gly Ala Gly Ala Gly Tyr Trp Gly Arg Thr
 405 410 415
 Glu Leu Asn Pro Gly Ile Phe Asp Ala Arg Pro Ala Gly Asp Gly Gln
 420 425 430
 Asp Gly Gly Trp Val Arg Thr Gly Asp Leu Gly Ala Leu Thr Gly Gly
 435 440 445
 Glu Leu Phe Leu Thr Gly Arg Leu Lys Glu Leu Leu Ile Val His Gly
 450 455 460
 Arg Asn Leu Ala Pro His Asp Leu Glu Arg Glu Ala Arg Ala Ala His
 465 470 475 480
 Asp Ala Val Asp His Gln Ile Gly Ala Ala Phe Gly Val Pro Ala Pro
 485 490 495
 Asp Glu Arg Ile Val Leu Val Gln Glu Val His Pro Arg Thr Pro Leu
 500 505 510
 Asp Glu Leu Pro Arg Val Ala Ser Ala Val Ser Arg Arg Leu Thr Val
 515 520 525
 Ser Phe Gly Val Pro Val Arg Asn Val Leu Leu Val Arg Arg Gly Thr
 530 535 540
 Val Arg Arg Thr Thr Ser Gly Lys Ile Arg Arg Thr Ala Val Arg Glu
 545 550 555 560
 Arg Phe Leu Ala Gly Gly Ile Thr Ala Leu His Ala Glu Leu Glu Pro
 565 570 575
 Ala Leu Arg Pro Val Gln Ala Gly Ala Gly Arg
 580 585

<210> 28

<211> 75

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. Ti is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 28

Val Pro Asn Pro Phe Glu Asp Pro Asp Ala Asn Tyr Leu Val Leu Val
 1 5 10 15
 Asn Asp Glu Gly Gln His Ser Leu Trp Pro Val Phe Ala Asp Val Pro
 20 25 30
 Asp Gly Trp Thr Thr Val Phe Gly Glu Ala Gly Arg Gln Asp Cys Leu
 35 40 45
 Asp Tyr Ile Glu Lys Ser Trp Thr Asp Met Arg Pro Lys Ser Leu Ile

50 55 60

Ala Ala Met Glu Lys Gln Lys Gln Pro Gln Ser
65 70 75

<210> 29
<211> 94
<212> PRT
<213> Actinoplanes sp.

<220>
<221> misc_feature
<222> (1)..(1)
<223> V is a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 29

Val Ala Pro Gly Ala Pro Pro Ala Glu His Gly Glu Ala Val Pro Glu
1 5 10 15

Ala Asp Ile Pro Val Leu Arg Asn Arg Ile Asp Glu Ile Asp Ala Ala
20 25 30

Ile Met Arg Leu Trp Gln Glu Arg Ala Ser Ile Ser Gln Lys Ile Gly
35 40 45

Ser Ile Arg Leu Ala Ser Gly Gly Thr Arg Val Val Leu Ser Arg Glu
50 55 60

Gln Glu Val Ile Gln Arg Phe Arg Ala Ala Leu Gly Glu Asp Gly Thr
65 70 75 80

Thr Ile Ala Leu Met Leu Leu Arg Ala Gly Arg Gly Pro Leu
85 90

<210> 30
<211> 619
<212> PRT
<213> Actinoplanes sp.

<220>
<221> misc_feature
<222> (1)..(1)
<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 30

Val Asp Val Pro Arg Val Arg Pro Pro Gly Ala Ala Pro Ala Pro Arg
1 5 10 15

Arg Arg Arg Trp Arg Phe Trp Gln Ser Pro Asp Gly Gln Pro Ala Trp
20 25 30

Ala Arg Pro Ala Leu Leu Gly Ile Ala Ala Leu Ala Ala Val Leu Tyr
35 40 45

Thr Ala Asn Leu Ala Arg Ser Gly Tyr Pro Met Tyr Tyr Ala Val Ala
 50 55 60
 Val Lys Ser Met Ser Val Ser Trp Pro Ala Phe Trp Thr Gly Ala Phe
 65 70 75 80
 Asp Pro Ala Ala Ser Ile Thr Ile Asp Lys Leu Ala Gly Ala Phe Val
 85 90 95
 Pro Gln Ala Leu Ser Ala Arg Val Phe Gly Phe His Gln Trp Ser Leu
 100 105 110
 Ala Leu Pro Gln Ala Val Glu Gly Val Ile Ala Val Leu Val Leu Tyr
 115 120 125
 Arg Ala Val Arg Arg Trp His Gly Pro Gly Ala Gly Leu Ala Ala Ala
 130 135 140
 Gly Leu Phe Ala Thr Thr Pro Ile Val Ser Ser Met Phe Gly His Ser
 145 150 155 160
 Met Glu Asp Gly Ala Leu Thr Leu Cys Leu Val Leu Ala Ala Asp Ala
 165 170 175
 Phe Gly Ala Ala Val Thr Arg Gly Ser Pro Ala Arg Leu Ala Leu Ala
 180 185 190
 Gly Ala Trp Ile Gly Leu Gly Phe Gln Ala Lys Met Met Gln Ala Trp
 195 200 205
 Leu Val Leu Pro Ala Leu Val Val Thr Tyr Leu Ala Gly Ala Pro Val
 210 215 220
 Arg Ala Arg Ala Arg Val Val His Val Ala Ala Ala Val Ala Ala Thr
 225 230 235 240
 Leu Ala Val Ser Leu Leu Trp Val Leu Ala Leu Thr Leu Leu Pro Gly
 245 250 255
 Ser His Arg Pro Trp Ala Asp Gly Thr Thr Ser Gly Asn Ala Phe Ala
 260 265 270
 Met Val Phe Gly Tyr Asn Gly Phe Asp Arg Ala Gly Ile His Val Pro
 275 280 285
 Gly Ala Leu Thr Thr Gly Phe Thr Asp Gly Gly Ala Ala Ala Gly Gly
 290 295 300
 Ser Trp Thr Ala Leu Ala Ala Asp Arg Leu Ala Thr Gln Ile Gly Trp
 305 310 315 320
 Trp Tyr Pro Leu Ala Leu Thr Gly Leu Leu Leu Gly Leu Ala Arg Trp
 325 330 335
 Arg Thr Ala Arg Ala Gly Leu Leu Phe Trp Gly Leu Trp Leu Leu Thr
 340 345 350
 Ala Ala Val Val Leu Ser Arg Ile Thr Ile Gln His Asn Ala Tyr Leu
 355 360 365

Ala Val Leu Ala Pro Pro Leu Ala Ala Leu Ala Ala Ala Gly Ala Val
 370 375 380
 Gln Leu Trp Arg Thr His Arg Asp Gly Thr Ala Pro Trp Leu Leu Pro
 385 390 395 400
 Ala Val Val Val Val Gln Ala Gly Trp Thr Leu Trp Leu Ala Thr Arg
 405 410 415
 Tyr Pro Ser Phe Leu Ala Gly Leu Thr Trp Thr Ala Pro Ile Ala Ala
 420 425 430
 Val Leu Ala Val Val Val Leu Ala Ala Arg Pro Thr Ala Arg Arg Pro
 435 440 445
 Ala Val Val Val Val Val Ala Gly Leu Leu Ala Val Pro Val Ala Trp
 450 455 460
 Gly Ala Ser Val Leu Asn Pro Arg Tyr Ala Gly Thr Ser Phe Glu Ala
 465 470 475 480
 Gly Ala Gly Pro Ser Gly Pro Val Gly Val Arg Leu Asp Asp Asp Thr
 485 490 495
 Thr Asp Arg Leu Thr Pro Gly Leu Arg Arg Leu Asp Asp Tyr Leu Ala
 500 505 510
 Ala His Arg Asp Gly Arg Thr Tyr Leu Ala Ala Thr Ser Ser Trp Arg
 515 520 525
 Thr Ala Gly Arg Leu Ile Val Pro Thr Gly His Ser Tyr Leu Pro Leu
 530 535 540
 Gly Gly Phe Ser Gly Ala Ala Pro Phe Pro Ser Leu Ala Gly Val Gln
 545 550 555 560
 Arg Leu Val Arg Asp Gly Glu Leu Arg Tyr Phe Val Leu Gly Gly Pro
 565 570 575
 Glu Gly Leu Gly Gly Glu Ala Thr Glu Ala Tyr Arg Ile Thr Gly Trp
 580 585 590
 Val Leu Glu Thr Cys Ala Thr Val Pro Pro Ala Glu His Gly Ala Asp
 595 600 605
 Pro Asp Leu Thr Val Leu Arg Cys Asp Lys Pro
 610 615

<210> 31

<211> 355

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 31

Val	Asp	Asn	Gly	Thr	Phe	Thr	Asp	Leu	Arg	Ile	Asp	His	Ile	Glu	Phe	1	5	10	15
Ala	Val	Ala	Asp	Val	Glu	Ser	Ala	Ser	Ala	Pro	Phe	Thr	Glu	Gly	Tyr	20	25	30	
Gly	Phe	Ser	Val	Tyr	Gly	Gly	Thr	Gly	Asp	Ala	His	Ala	Pro	Val	Arg	35	40	45	
Arg	Val	Ala	Leu	Gly	Arg	Asp	Asp	Ile	Arg	Leu	Val	Leu	Thr	Ala	Ala	50	55	60	
Pro	Gly	Gly	Asp	His	Pro	Ala	Met	Ala	Tyr	Val	Glu	Gln	His	Gly	Asp	65	70	75	80
Gly	Val	Ser	Ala	Ile	Ala	Leu	Ser	Thr	Arg	Asp	Ala	His	Ala	Ala	Phe	85	90	95	
Thr	Glu	Ala	Val	Arg	Arg	Gly	Ala	Val	Gly	Val	Ser	Ala	Pro	Val	Thr	100	105	110	
Gly	Asn	Gly	Val	Thr	Val	Ala	Thr	Ile	Arg	Gly	Phe	Gly	Asp	Val	Leu	115	120	125	
His	Thr	Phe	Val	Glu	Arg	Ala	Pro	Gly	Ala	Asp	Pro	Arg	Thr	Leu	Pro	130	135	140	
Gly	Leu	Glu	Leu	Arg	Arg	Pro	Ser	Pro	Thr	Arg	Phe	Asp	Ser	Gly	Leu	145	150	155	160
Gln	Ala	Ile	Asp	His	Ile	Ala	Val	Cys	Leu	Glu	Pro	Gly	Thr	Leu	Asp	165	170	175	
Pro	Thr	Val	Asp	Phe	Tyr	Arg	Asp	Val	Leu	Asp	Phe	Glu	Met	Ile	Phe	180	185	190	
Glu	Glu	Arg	Ile	Leu	Val	Gly	Arg	Gln	Ala	Met	Asp	Ser	Lys	Val	Val	195	200	205	
Gln	Ser	Arg	Ser	Gly	Gly	Val	Thr	Leu	Thr	Leu	Ile	Glu	Pro	Asp	Thr	210	215	220	
Ser	Leu	Glu	Gln	Gly	Gln	Ile	Asp	Thr	Phe	Leu	Lys	Asn	His	Gly	Gly	225	230	235	240
Pro	Gly	Val	Gln	His	Leu	Ala	Phe	Ile	Thr	Asp	Asp	Val	Leu	Arg	Ser	245	250	255	
Val	Gly	Arg	Met	Ser	Glu	His	Gly	Val	Glu	Phe	Leu	His	Thr	Pro	Asp	260	265	270	
Ser	Tyr	Tyr	Gly	Arg	Leu	Pro	Gly	Arg	Ile	Pro	Gln	Ala	Gly	His	Pro	275	280	285	
Ile	Gln	Ala	Leu	Arg	Asp	Leu	Asn	Val	Leu	Val	Asp	Gln	Asp	His	Asp	290	295	300	
Gly	Gln	Leu	Phe	Gln	Ile	Phe	Thr	Lys	Ser	Val	His	Pro	Arg	Gly	Thr	305	310	315	320

Ile Phe Met Glu Val Ile Glu Arg Met Gly Ala Arg Ser Phe Gly Ser
 325 330 335

Gly Asn Ile Lys Ala Leu Tyr Glu Ala Val Glu Leu Asp Met Ser Lys
 340 345 350

Gln Ser Ala
 355

<210> 32
 <211> 429
 <212> PRT
 <213> Actinoplanes sp.

<400> 32

Met Glu Ser Pro Ala Thr His Ala Glu Leu Val Ile Gly Thr Val Leu
 1 5 10 15

Leu Asp Ile Ala Leu Val Leu Ala Ala Gly Ala Leu Leu Gly Arg Trp
 20 25 30

Val Arg Arg Leu Arg Gln Pro Ala Val Ile Gly Glu Ile Leu Ala Gly
 35 40 45

Ile Ala Leu Gly Pro Ser Leu Leu Gly Leu Leu Pro Gly Asn Pro Thr
 50 55 60

Ala Trp Leu Phe Pro Ala Glu Ala Arg Pro Tyr Leu Ser Ala Val Ala
 65 70 75 80

Gln Ile Gly Leu Ala Leu Phe Thr Phe Leu Ile Gly Trp Glu Phe Asn
 85 90 95

Pro Ala Thr Leu Ala Arg His Arg Gly Thr Ala Ala Ala Val Ser Ile
 100 105 110

Gly Ser Ile Ala Val Ser Phe Gly Leu Gly Ile Ala Leu Ala Thr Val
 115 120 125

Leu His Pro Arg His Asp Thr Thr Gly Gly Gly Lys Val Gly Phe Thr
 130 135 140

Glu Phe Ala Leu Phe Leu Gly Val Ala Met Ser Ile Thr Ala Phe Pro
 145 150 155 160

Val Leu Ala Arg Ile Leu Ala Glu Arg Arg Leu Thr Gly Thr Arg Val
 165 170 175

Gly Ser Ile Ala Leu Val Ser Ala Ala Ile Asp Asp Val Val Ala Trp
 180 185 190

Cys Leu Leu Ala Leu Val Thr Ala Ile Ala Thr Ala Ser Gly Pro Val
 195 200 205

Gln Leu Val Arg Ile Leu Ala Leu Leu Ala Val Phe Leu Val Val Leu
 210 215 220

Val Thr Val Val Arg Pro Leu Leu Val Leu Leu Ala Arg Arg Pro Ser
 225 230 235 240

Ala Ser Tyr Leu Leu Val Ala Val Val Ala Val Val Leu Leu Ser Ala
 245 250 255
 Tyr Ala Thr Thr Trp Ile Gly Leu His Ala Ile Phe Gly Ala Phe Cys
 260 265 270
 Ala Gly Leu Val Met Pro Arg Glu Pro Ala Ala Ala Leu Arg Glu Arg
 275 280 285
 Val Arg Gln Pro Leu Glu His Val Ser Val Val Leu Leu Pro Val Phe
 290 295 300
 Phe Ile Val Thr Gly Leu Gly Val Asp Ile Gly Ala Leu Thr Ala Ala
 305 310 315 320
 Asn Ile Leu Glu Leu Ala Ala Ile Ile Val Ile Ala Cys Ala Gly Lys
 325 330 335
 Leu Ala Gly Ala Ile Val Pro Ala Val Ser Leu Gly Met Ser Trp Arg
 340 345 350
 Asp Ala Arg Thr Leu Gly Leu Leu Val Asn Thr Arg Gly Leu Thr Glu
 355 360 365
 Leu Val Val Leu Asn Val Gly Leu Gln Leu Ala Val Leu Asp Gly Gln
 370 375 380
 Met Phe Thr Met Met Val Leu Met Ala Leu Val Thr Thr Ala Leu Ala
 385 390 395 400
 Gly Pro Leu Ile Gly Ser Ala Arg Thr Pro Ala Ala Gly Ala Pro Ala
 405 410 415
 Gln Ala Leu Pro Ala Glu Pro Arg Thr Arg Arg Ala Ala
 420 425

<210> 33
 <211> 189
 <212> PRT
 <213> Actinoplanes sp.

 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 33

Val Ser Asp Glu Ala Ala Val Pro Ser Pro Ala Arg Leu Leu Arg Asp
 1 5 10 15
 Phe Val Asn Thr Tyr Glu Pro Gln Val Asp Asp Glu Ser Leu Ser Thr
 20 25 30
 Pro Asp Ala Leu Arg Ala Trp Leu Ala Gly Glu Ser Leu Leu Ala Pro
 35 40 45

Gly Ala Arg Val Arg Pro Ala Asp Leu Ala Arg Ala Val Ala Leu Arg
 50 55 60

Glu Gly Leu Arg Gln Val Leu Leu Gly His Ala Gly His Pro Ala Asp
 65 70 75 80

Pro Ala Ala Leu Arg Arg Leu Glu Glu Ile Leu Ala Ala Val Pro Val
 85 90 95

Arg Leu Ser Leu Ala Gly Gly Ala Pro Arg Leu Leu Pro Ala Gly Gly
 100 105 110

Thr Pro Phe Asp Arg Ala Leu Ala Gly Leu Ile Asp Ala Val Arg Gln
 115 120 125

Cys Ala Glu Leu Gln Val Trp Thr Arg Leu Lys Val Cys Asp Arg Asp
 130 135 140

Thr Cys Arg Trp Ala Tyr Tyr Asp Ala Ser Arg Asn Gln Ala Arg Arg
 145 150 155 160

Trp Cys Ser Met Ala Gly Cys Gly Asn Tyr Ile Lys Met Arg Arg Ala
 165 170 175

Tyr Ala Ala Arg Arg Val Arg Gly Ser Ala Gly Ser Ala
 180 185

<210> 34

<211> 309

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 34

Val Ala Thr Thr Leu Arg Asp Val Ala Arg Leu Ala Arg Val Ser Val
 1 5 10 15

Lys Thr Val Ser Asn Val Val Asn Asp His Pro His Val Ser Asp Asp
 20 25 30

Val Arg Arg Arg Val Glu Thr Ala Ile Arg Gln Leu Gly Tyr Arg Pro
 35 40 45

Asn Leu Val Ala Arg Ala Leu Arg Ser Gly Arg Gly Ser Gly Leu Leu
 50 55 60

Ala Leu Ala Met Pro Gly Ala Gly Ala Pro Gln Ser Pro Ala Leu Ile
 65 70 75 80

Glu Glu Ile Ile Arg Arg Ala Ala Pro Leu Gly Phe Arg Val Leu Ile
 85 90 95

Glu Pro Leu Glu Ser Ser Arg Pro Arg Pro Pro Ala Pro Gly Val Asp

100										105					110				
Ala	Arg	Leu	Leu	Asn	Ala	Glu	Ala	Pro	Ala	Pro	Glu	Leu	Val	Asp	Ala				
		115					120					125							
Gln	Ala	Ala	Thr	Gly	Thr	Pro	Leu	Val	Leu	Leu	Thr	Gly	Thr	Pro	Asp				
	130					135					140								
Pro	Arg	Tyr	Asp	Cys	Val	Gly	Pro	Asp	Ala	Ala	Arg	Ala	Ala	Glu	Asp				
145					150					155				160					
Ala	Val	Asp	His	Leu	Arg	Arg	Leu	Gly	Arg	Arg	Arg	Val	Ala	Thr	Ile				
			165					170						175					
Gly	Gly	Ser	Leu	Ser	Thr	Gly	Pro	Ala	Gly	Ser	Gly	Ser	Asp	Phe	Gly				
		180					185						190						
Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly				
	195					200					205								
Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Ser	Gly	Phe	Gly	Ser	Gly				
	210					215					220								
Ser	Gly	Phe	Gly	Ser	Gly	Ser	Ala	Glu	Gly	Tyr	Arg	Ala	Ala	Arg	Gln				
225				230					235					240					
Leu	Leu	Gly	His	Glu	Asp	Arg	Pro	Asp	Ala	Ile	Val	Cys	Gly	Ser	Val				
			245					250					255						
Arg	Leu	Ala	Val	Gly	Val	Ile	Arg	Ala	Ala	Ala	Asp	Ala	Gly	Leu	Arg				
		260					265					270							
Val	Pro	Glu	Asp	Val	Ala	Val	Ile	Gly	Ile	Gly	Asp	Gly	Glu	Glu	Gly				
	275					280					285								
Arg	Tyr	Thr	Arg	Pro	Ala	Leu	Thr	Thr	Val	Ala	Thr	Asp	Pro	Ala	Phe				
	290					295					300								
Ile	Ala	Gly	Lys	Ala															
305																			

<210> 35
 <211> 542
 <212> PRT
 <213> Bacillus brevis

<400> 35

Met	Leu	Asn	Ser	Ser	Lys	Ser	Ile	Leu	Ile	His	Ala	Gln	Asn	Lys	Asn				
1			5					10					15						
Gly	Thr	His	Glu	Glu	Glu	Gln	Tyr	Leu	Phe	Ala	Val	Asn	Asn	Thr	Lys				
		20					25					30							
Ala	Glu	Tyr	Pro	Arg	Asp	Lys	Thr	Ile	His	Gln	Leu	Phe	Glu	Glu	Gln				
	35					40					45								
Val	Ser	Lys	Arg	Pro	Asn	Asn	Val	Ala	Ile	Val	Cys	Glu	Asn	Glu	Gln				
	50				55					60									
Leu	Thr	Tyr	His	Glu	Leu	Asn	Val	Lys	Ala	Asn	Gln	Leu	Ala	Arg	Ile				

65	70	75	80
Phe Ile Glu Lys Gly Ile Gly Lys Asp Thr Leu Val Gly Ile Met Met	85	90	95
Glu Lys Ser Ile Asp Leu Phe Ile Gly Ile Leu Ala Val Leu Lys Ala	100	105	110
Gly Gly Ala Tyr Val Pro Ile Asp Ile Glu Tyr Pro Lys Glu Arg Ile	115	120	125
Gln Tyr Ile Leu Asp Asp Ser Gln Ala Arg Met Leu Leu Thr Gln Lys	130	135	140
His Leu Val His Leu Ile His Asn Ile Gln Phe Asn Gly Gln Val Glu	145	150	155
Ile Phe Glu Glu Asp Thr Ile Lys Ile Arg Glu Gly Thr Asn Leu His	165	170	175
Val Pro Ser Lys Ser Thr Asp Leu Ala Tyr Val Ile Tyr Thr Ser Gly	180	185	190
Thr Thr Gly Asn Pro Lys Gly Thr Met Leu Glu His Lys Gly Ile Ser	195	200	205
Asn Leu Lys Val Phe Phe Glu Asn Ser Leu Asn Val Thr Glu Lys Asp	210	215	220
Arg Ile Gly Gln Phe Ala Ser Ile Ser Phe Asp Ala Ser Val Trp Glu	225	230	235
Met Phe Met Ala Leu Leu Thr Gly Ala Ser Leu Tyr Ile Ile Leu Lys	245	250	255
Asp Thr Ile Asn Asp Phe Val Lys Phe Glu Gln Tyr Ile Asn Gln Lys	260	265	270
Glu Ile Thr Val Ile Thr Leu Pro Pro Thr Tyr Val Val His Leu Asp	275	280	285
Pro Glu Arg Ile Leu Ser Ile Gln Thr Leu Ile Thr Ala Gly Ser Ala	290	295	300
Thr Ser Pro Ser Leu Val Asn Lys Trp Lys Glu Lys Val Thr Tyr Ile	305	310	315
Asn Ala Tyr Gly Pro Thr Glu Thr Thr Ile Cys Ala Thr Thr Trp Val	325	330	335
Ala Thr Lys Glu Thr Ile Gly His Ser Val Pro Ile Gly Ala Pro Ile	340	345	350
Gln Asn Thr Gln Ile Tyr Ile Val Asp Glu Asn Leu Gln Leu Lys Ser	355	360	365
Val Gly Glu Ala Gly Glu Leu Cys Ile Gly Gly Glu Gly Leu Ala Arg	370	375	380
Gly Tyr Trp Lys Arg Pro Glu Leu Thr Ser Gln Lys Phe Val Asp Asn	385	390	395
			400

Pro Phe Val Pro Gly Glu Lys Leu Tyr Lys Thr Gly Asp Gln Ala Arg
 405 410 415
 Trp Leu Ser Asp Gly Asn Ile Glu Tyr Leu Gly Arg Ile Asp Asn Gln
 420 425 430
 Val Lys Ile Arg Gly His Arg Val Glu Leu Glu Glu Val Glu Ser Ile
 435 440 445
 Leu Leu Lys His Met Tyr Ile Ser Glu Thr Ala Val Ser Val His Lys
 450 455 460
 Asp His Gln Glu Gln Pro Tyr Leu Cys Ala Tyr Phe Val Ser Glu Lys
 465 470 475 480
 His Ile Pro Leu Glu Gln Leu Arg Gln Phe Ser Ser Glu Glu Leu Pro
 485 490 495
 Thr Tyr Met Ile Pro Ser Tyr Phe Ile Gln Leu Asp Lys Met Pro Leu
 500 505 510
 Thr Ser Asn Gly Lys Ile Asp Arg Lys Gln Leu Pro Glu Pro Asp Leu
 515 520 525
 Thr Phe Gly Met Arg Val Asp Tyr Glu Ala Pro Arg Asn Glu
 530 535 540

<210> 36
 <211> 582
 <212> PRT
 <213> Mycobacterium bovis

<400> 36

Met Ala Met Ser Val Arg Ser Leu Pro Ala Ala Leu Arg Ala Cys Ala
 1 5 10 15
 Cys Leu Gln Pro His Asp Pro Ala Phe Thr Phe Met Asp Tyr Glu Gln
 20 25 30
 Asp Trp Asp Gly Val Ala Ile Thr Leu Thr Trp Ser Gln Leu Tyr Arg
 35 40 45
 Arg Thr Leu Asn Val Ala Arg Glu Leu Ser Arg Cys Gly Ser Thr Gly
 50 55 60
 Asp Arg Val Val Ile Ser Ala Pro Gln Gly Leu Glu Tyr Val Val Ala
 65 70 75 80
 Phe Leu Gly Ala Leu Gln Ala Gly Arg Ile Ala Val Pro Leu Ser Val
 85 90 95
 Pro Gln Gly Gly Val Thr Asp Glu Arg Ser Asp Ser Val Leu Ser Asp
 100 105 110
 Ser Ser Pro Val Ala Ile Leu Thr Thr Ser Ser Ala Val Asp Asp Val
 115 120 125
 Val Gln His Val Ala Arg Arg Pro Gly Glu Ser Pro Pro Ser Ile Ile
 130 135 140

Glu	Val	Asp	Leu	Leu	Asp	Leu	Asp	Ala	Pro	Asn	Gly	Tyr	Thr	Phe	Lys	145	150	155	160
Glu	Asp	Glu	Tyr	Pro	Ser	Thr	Ala	Tyr	Leu	Gln	Tyr	Thr	Ser	Gly	Ser	165	170	175	
Thr	Arg	Thr	Pro	Ala	Gly	Val	Val	Met	Ser	His	Gln	Asn	Val	Arg	Val	180	185	190	
Asn	Phe	Glu	Gln	Leu	Met	Ser	Gly	Tyr	Phe	Ala	Asp	Thr	Asp	Gly	Ile	195	200	205	
Pro	Pro	Pro	Asn	Ser	Ala	Leu	Val	Ser	Trp	Leu	Pro	Phe	Tyr	His	Asp	210	215	220	
Met	Gly	Leu	Val	Ile	Gly	Ile	Cys	Ala	Pro	Ile	Leu	Gly	Gly	Tyr	Pro	225	230	235	240
Ala	Val	Leu	Thr	Ser	Pro	Val	Ser	Phe	Leu	Gln	Arg	Pro	Ala	Arg	Trp	245	250	255	
Met	His	Leu	Met	Ala	Ser	Asp	Phe	His	Ala	Phe	Ser	Ala	Ala	Pro	Asn	260	265	270	
Phe	Ala	Phe	Glu	Leu	Ala	Ala	Arg	Arg	Thr	Thr	Asp	Asp	Asp	Met	Ala	275	280	285	
Gly	Arg	Asp	Leu	Gly	Asn	Ile	Leu	Thr	Ile	Leu	Ser	Gly	Ser	Glu	Arg	290	295	300	
Val	Gln	Ala	Ala	Thr	Ile	Lys	Arg	Phe	Ala	Asp	Arg	Phe	Ala	Arg	Phe	305	310	315	320
Asn	Leu	Gln	Glu	Arg	Val	Ile	Arg	Pro	Ser	Tyr	Gly	Leu	Ala	Glu	Ala	325	330	335	
Thr	Val	Tyr	Val	Ala	Thr	Ser	Lys	Pro	Gly	Gln	Pro	Pro	Glu	Thr	Val	340	345	350	
Asp	Phe	Asp	Thr	Glu	Ser	Leu	Ser	Ala	Gly	His	Ala	Lys	Pro	Cys	Ala	355	360	365	
Gly	Gly	Gly	Ala	Thr	Ser	Leu	Ile	Ser	Tyr	Met	Leu	Pro	Arg	Ser	Pro	370	375	380	
Ile	Val	Arg	Ile	Val	Asp	Ser	Asp	Thr	Cys	Ile	Glu	Cys	Pro	Asp	Gly	385	390	395	400
Thr	Val	Gly	Glu	Ile	Trp	Val	His	Gly	Asp	Asn	Val	Gly	Asn	Gly	Tyr	405	410	415	
Trp	Gln	Lys	Pro	Asp	Glu	Ser	Glu	Arg	Thr	Phe	Gly	Gly	Lys	Ile	Val	420	425	430	
Thr	Pro	Ser	Pro	Gly	Thr	Pro	Glu	Gly	Pro	Trp	Leu	Arg	Thr	Gly	Asp	435	440	445	
Ser	Gly	Phe	Val	Thr	Asp	Gly	Lys	Met	Phe	Ile	Ile	Gly	Arg	Ile	Lys	450	455	460	

Asp Leu Leu Ile Val Tyr Gly Arg Asn His Ser Pro Asp Asp Ile Glu
465 470 475 480

Glu Thr Ile Gln Glu Ile Thr Arg Gly Arg Cys Ala Ala Ile Ser Val
485 490 495

Pro Gly Asp Arg Arg Thr Glu Lys Leu Val Ala Ile Ile Glu Leu Lys
500 505 510

Lys Arg Gly Asp Ser Asp Gln Asp Ala Met Ala Arg Leu Gly Ala Ile
515 520 525

Lys Arg Glu Val Thr Ser Ala Leu Ser Ser Ser His Gly Leu Ser Val
530 535 540

Ala Asp Leu Val Leu Val Ala Pro Gly Ser Ile Pro Ile Thr Thr Ser
545 550 555 560

Gly Lys Val Arg Arg Gly Ala Cys Val Glu Gln Tyr Arg Gln Asp Gln
565 570 575

Phe Ala Arg Leu Asp Ala
580

<210> 37

<211> 619

<212> PRT

<213> Mycobacterium tuberculosis

<400> 37

Met Lys Thr Asn Ser Ser Phe His Ala Ala Gly Glu Val Ala Thr Gln
1 5 10 15

Pro Ala Trp Gly Thr Gly Glu Gln Ala Ala Gln Pro Leu Asn Gly Ser
20 25 30

Thr Ser Arg Phe Ala Met Ser Glu Ser Ser Leu Ala Asp Leu Leu Gln
35 40 45

Lys Ala Ala Ser Gln Tyr Pro Asn Arg Ala Ala Tyr Lys Phe Ile Asp
50 55 60

Tyr Asp Thr Asp Pro Ala Gly Phe Thr Glu Thr Val Thr Trp Trp Gln
65 70 75 80

Val His Arg Arg Ala Met Ile Val Ala Glu Glu Leu Trp Ile Tyr Ala
85 90 95

Ser Ser Gly Asp Arg Val Ala Ile Leu Ala Pro Gln Gly Leu Glu Tyr
100 105 110

Ile Ile Ala Phe Met Gly Val Leu Gln Ala Gly Leu Ile Ala Val Pro
115 120 125

Leu Pro Val Pro Gln Phe Gly Ile His Asp Glu Arg Ile Ser Ser Ala
130 135 140

Leu Arg Asp Ser Ala Pro Ser Ile Ile Leu Thr Thr Ser Ser Val Ile
145 150 155 160

Asp Glu Val Thr Thr Tyr Ala Pro His Ala Cys Ala Ala Gln Gly Gln
 165 170 175
 Ser Ala Pro Ile Val Val Ala Val Asp Ala Leu Asp Leu Ser Ser Ser
 180 185 190
 Arg Ala Leu Asp Pro Thr Arg Phe Glu Arg Pro Ser Thr Ala Tyr Leu
 195 200 205
 Gln Tyr Thr Ser Gly Ser Thr Arg Ala Pro Ala Gly Val Val Leu Ser
 210 215 220
 His Lys Asn Val Ile Thr Asn Cys Val Gln Leu Met Ser Asp Tyr Ile
 225 230 235 240
 Gly Asp Ser Glu Lys Val Pro Ser Thr Pro Val Ser Trp Leu Pro Phe
 245 250 255
 Tyr His Asp Met Gly Leu Met Leu Gly Ile Ile Leu Pro Met Ile Asn
 260 265 270
 Gln Asp Thr Ala Val Leu Met Ser Pro Met Ala Phe Leu Gln Arg Pro
 275 280 285
 Ala Arg Trp Met Gln Leu Leu Ala Lys His Arg Ala Gln Ile Ser Ser
 290 295 300
 Ala Pro Asn Phe Gly Phe Glu Leu Ala Val Arg Arg Thr Ser Asp Asp
 305 310 315 320
 Asp Met Ala Gly Leu Asp Leu Gly His Val Arg Thr Ile Val Thr Gly
 325 330 335
 Ala Glu Arg Val Asn Val Ala Thr Leu Arg Arg Phe Thr Glu Arg Phe
 340 345 350
 Ala Pro Phe Asn Leu Ser Glu Thr Ala Ile Arg Pro Ser Tyr Gly Leu
 355 360 365
 Ala Glu Ala Thr Val Tyr Val Ala Thr Ala Gly Pro Gly Arg Ala Pro
 370 375 380
 Lys Ser Val Cys Phe Asp Tyr Gln Gln Leu Ser Val Gly Gln Ala Lys
 385 390 395 400
 Arg Ala Glu Asn Gly Ser Glu Gly Ala Asn Leu Val Ser Tyr Gly Ala
 405 410 415
 Pro Arg Ala Ser Thr Val Arg Ile Val Asp Pro Glu Thr Arg Met Glu
 420 425 430
 Asn Pro Ala Gly Thr Val Gly Glu Ile Trp Val Gln Gly Asp Asn Val
 435 440 445
 Gly Leu Gly Tyr Trp Arg Asn Pro Gln Gln Thr Glu Ala Thr Phe Arg
 450 455 460
 Ala Arg Leu Val Thr Pro Ser Pro Gly Thr Ser Glu Gly Pro Trp Leu
 465 470 475 480
 Arg Thr Gly Asp Leu Gly Val Ile Phe Glu Gly Glu Leu Phe Ile Thr

145		150		155		160
Gly Ser Thr Arg	Arg Pro Arg Gly Val Met Val Gly His Gly Asn Leu	165	170	175		
Leu Ala Asn Glu Arg Cys Ile Ala Ala Ala Cys Gly His Asp Arg Asp		180	185	190		
Ser Thr Phe Val Gly Trp Ala Pro Phe Phe His Asp Met Gly Leu Val		195	200	205		
Ala Asn Leu Leu Gln Pro Leu Tyr Leu Gly Ser Leu Ser Val Leu Met		210	215	220		
Pro Pro Met Ala Phe Leu Gln Arg Pro Ala Arg Trp Leu Arg Ala Val		225	230	235		240
Ser Arg Tyr Arg Ala His Thr Ser Gly Gly Pro Asn Phe Ala Tyr Asp		245	250	255		
Leu Cys Val Asp Arg Val Gly Glu Asp Glu Arg Ala Gly Leu Asp Leu		260	265	270		
Ser Gly Trp Lys Val Ala Tyr Asn Gly Ala Glu Pro Val Arg Ala Asp		275	280	285		
Thr Leu Arg Arg Phe Thr Asp Arg Phe Ala Pro His Gly Phe Thr Pro		290	295	300		
Gly Ala His Phe Pro Thr Tyr Gly Leu Ala Glu Ala Thr Leu Leu Val		305	310	315		320
Ala Thr Gly Pro Lys Gly Val Pro Pro Arg Thr Leu Thr Ala Asp Arg		325	330	335		
Ala Ala Leu Arg Ala Gly Arg Leu Arg Pro Ala Gly Pro Gly Glu Ala		340	345	350		
Gly Leu Glu Leu Val Gly Asn Gly Thr Ala Gly Leu Asp Thr Thr Leu		355	360	365		
Arg Ile Val Asp Pro Ala Thr Ala Arg Glu Cys Pro Pro Gly Glu Val		370	375	380		
Gly Glu Val Trp Val Arg Gly Pro Gly Val Ala Arg Gly Tyr Phe Gly		385	390	395		400
Arg Pro Arg Glu Ser Ala Pro Leu Leu Ala Ala Arg Leu Pro Gly Gly		405	410	415		
Glu Gly Pro Tyr Leu Arg Thr Gly Asp Leu Gly Ala Leu His Asp Gly		420	425	430		
Glu Leu Phe Leu Thr Gly Arg His Lys Asp Leu Ile Val Ile Arg Gly		435	440	445		
Gln Asn His His Pro His Asp Leu Glu Arg Thr Ala Glu Gln Ala His		450	455	460		
Pro Ala Leu Arg Pro Thr Cys Ala Ala Ala Phe Ala Val Pro Gly Asp		465	470	475		480

Gly Ala Glu Arg Leu Val Leu Val Cys Glu Leu Thr Ser Tyr Arg Ala
485 490 495

Val Asp Pro Ala Ala Val Ala Glu Ala Val Arg Ala Ala Leu Ala Ala
500 505 510

Arg His Gly Val Ala Pro His Thr Leu Val Val Leu Arg Arg Gly Gly
515 520 525

Ile Pro Lys Thr Thr Ser Gly Lys Val Arg Arg Gly His Cys Arg Thr
530 535 540

Ala Tyr Leu Asp Gly Thr Leu Pro Val His Thr Ala Val Arg Leu Pro
545 550 555 560

<210> 39

<211> 600

<212> PRT

<213> Myxococcus xanthus

<400> 39

Met Ala Cys Arg Pro Asp Ser Leu His Ala Ser Ala Val Thr Ser Arg
1 5 10 15

Arg Arg Met Arg His Thr Leu Val Glu Leu Leu Gln Glu Arg Ala Leu
20 25 30

Ser Glu Pro Arg His Glu Ala Phe Thr Phe Leu Gly Glu Ala Gly Val
35 40 45

Pro Ala Val Arg Val Asp Tyr Ser Ser Met Asp Val Leu Ala Arg Ala
50 55 60

Ile Ala Ala Arg Leu Gln Ala Asp Gly Arg Val Gly Glu Arg Ala Leu
65 70 75 80

Leu Leu Tyr Ala Pro Gly Pro Glu Tyr Val Ala Ala Phe Phe Gly Cys
85 90 95

Leu Tyr Ala Gly Val Val Ala Val Pro Val Tyr Pro Pro Asp Thr Ala
100 105 110

Arg Leu Glu Arg Ser Leu Leu Arg Leu Arg Thr Val Ala Arg Asp Ser
115 120 125

Arg Ala Ser Val Val Leu Thr Thr Ser Phe Leu Gln Gly Leu Ala Gly
130 135 140

Ala Met Phe Glu Leu Ala Pro Glu Leu Gly Glu Leu Ser Trp Val Ala
145 150 155 160

Thr Asp Gly Ile Ala Leu Glu Glu Ala Gly Ala Trp Lys Pro Pro Gly
165 170 175

Leu Ser Gly Asp Ser Val Ala Phe Leu Gln Tyr Thr Ser Gly Ser Thr
180 185 190

Ala Asp Pro Lys Gly Val Val Leu Thr His Arg Asn Leu Met His Asn
195 200 205

Leu Ser Val Ile His Glu Arg Phe Gln Leu Asn Arg Gly Ser Arg Gly
 210 215 220
 Val Ile Trp Leu Pro Pro Tyr His Asp Met Gly Leu Ile Gly Gly Val
 225 230 235 240
 Leu Thr Pro Ile Phe Gly Gly Leu Pro Val Asp Leu Met Ser Pro Leu
 245 250 255
 Ser Phe Leu Gln Glu Pro Leu Arg Trp Leu Lys Thr Leu Ser Glu Arg
 260 265 270
 Arg Gly Thr Cys Ser Gly Gly Pro Asn Phe Ala Tyr Glu Leu Cys Val
 275 280 285
 Arg Lys Ile Ser Asp Glu Gln Lys Ala Gly Leu Asp Leu Ser Ser Trp
 290 295 300
 Glu Leu Ala Phe Cys Gly Ala Glu Pro Ile Arg Pro Asp Thr Leu Glu
 305 310 315 320
 Ala Phe Ser Lys Ala Phe Glu Pro Cys Gly Phe Arg Arg Glu Ala Phe
 325 330 335
 Tyr Pro Cys Tyr Gly Leu Ala Glu Gly Thr Leu Ile Val Thr Gly Val
 340 345 350
 Ser Lys Gly Arg Ala Ala Arg Val Glu His Phe Gln Arg Glu Ala Leu
 355 360 365
 Glu Ala His Arg Ala Val Ala Ala Ser Ser Pro Gly Glu Ala Ala Arg
 370 375 380
 Asp Thr Val Arg His Val Ser Cys Gly Thr Val Val Pro Asp Glu Gln
 385 390 395 400
 Ile Leu Val Val Asp Pro Glu Thr Arg Thr Ala Leu Pro Pro Gly His
 405 410 415
 Ile Gly Glu Ile Trp Val Arg Gly Pro Ser Val Ala Gln Gly Tyr Trp
 420 425 430
 Leu Arg Pro Glu Glu Thr Ala Arg Thr Phe Gln Ala Arg Leu Ala Gly
 435 440 445
 Gly Thr Glu Ala Pro Trp Leu Arg Thr Gly Asp Leu Gly Phe Leu His
 450 455 460
 Asp Gly Glu Leu Phe Val Ser Gly Arg Arg Lys Asp Leu Leu Val Ile
 465 470 475 480
 Arg Gly Arg Asn Tyr Tyr Pro Gln Asp Leu Glu Leu Thr Val Glu Arg
 485 490 495
 Ser His Pro Ala Leu Arg Pro Gly Cys Ala Ala Val Phe Ser Val Ser
 500 505 510
 Val Gly Ala Ser Glu Glu Val Val Val Val Gln Glu Val Asp Arg Arg
 515 520 525

Tyr Pro Gly Gly Asp Trp Pro Asp Val Ile Ala Ala Ile Arg Arg Asp
 530 535 540
 Ile Ser Glu Gln His Ala Leu Arg Val His Ala Val Val Leu Ile Lys
 545 550 555 560
 Ser Gly Ser Leu Leu Lys Thr Ser Ser Gly Lys Val Gln Arg Gly Ala
 565 570 575
 Thr Arg Glu Ala Tyr Leu Glu Gly Gln Leu Asp Thr Val Ser Ala Asp
 580 585 590
 Ala Ala Gln Glu Pro Val Gly Glu
 595 600
 <210> 40
 <211> 569
 <212> PRT
 <213> Bacillus subtilis
 <400> 40
 Met Tyr Thr Ser Gln Phe Gln Thr Leu Val Asp Val Ile Arg Asn Arg
 1 5 10 15
 Ser Asn Ile Ser Asp Arg Gly Ile Arg Phe Ile Glu Ser Asp Lys Ile
 20 25 30
 Glu Thr Phe Val Ser Tyr Arg Gln Leu Phe Asp Glu Ala Gln Gly Phe
 35 40 45
 Leu Gly Tyr Leu Gln His Ile Gly Ile Gln Pro Lys Gln Glu Ile Val
 50 55 60
 Phe Gln Ile Gln Glu Asn Lys Ser Phe Val Val Ala Phe Trp Ala Cys
 65 70 75 80
 Leu Leu Gly Gly Met Ile Pro Val Pro Val Ser Ile Gly Glu Asp Asn
 85 90 95
 Asp His Lys Leu Lys Val Trp Arg Ile Trp Asn Ile Leu Asn Asn Pro
 100 105 110
 Phe Leu Leu Ala Ser Glu Thr Val Leu Asp Lys Met Lys Lys Phe Ala
 115 120 125
 Ala Asp His Asp Leu Gln Asp Phe His His Gln Leu Ile Glu Lys Ser
 130 135 140
 Asp Ile Ile Gln Asp Arg Ile Tyr Asp His Pro Ala Ser Gln Tyr Glu
 145 150 155 160
 Pro Glu Ala Asp Glu Leu Ala Phe Ile Gln Phe Ser Ser Gly Ser Thr
 165 170 175
 Gly Asp Pro Lys Gly Val Met Leu Thr His His Asn Leu Ile His Asn
 180 185 190
 Thr Cys Ala Ile Arg Asn Ala Leu Ala Ile Asp Leu Lys Asp Thr Leu
 195 200 205

Leu Ser Trp Met Pro Leu Thr His Asp Met Gly Leu Ile Ala Cys His
 210 215 220
 Leu Val Pro Ala Leu Ala Gly Ile Asn Gln Asn Leu Met Pro Thr Glu
 225 230 235 240
 Leu Phe Ile Arg Arg Pro Ile Leu Trp Met Lys Lys Ala His Glu His
 245 250 255
 Lys Ala Ser Ile Leu Ser Ser Pro Asn Phe Gly Tyr Asn Tyr Phe Leu
 260 265 270
 Lys Phe Leu Lys Asp Asn Lys Ser Tyr Asp Trp Asp Leu Ser His Ile
 275 280 285
 Arg Val Ile Ala Asn Gly Ala Glu Pro Ile Leu Pro Glu Leu Cys Asp
 290 295 300
 Glu Phe Leu Thr Arg Cys Ala Ala Phe Asn Met Lys Arg Ser Ala Ile
 305 310 315 320
 Leu Asn Val Tyr Gly Leu Ala Glu Ala Ser Val Gly Ala Thr Phe Ser
 325 330 335
 Asn Ile Gly Glu Arg Phe Val Pro Val Tyr Leu His Arg Asp His Leu
 340 345 350
 Asn Leu Gly Glu Arg Ala Val Glu Val Ser Lys Glu Asp Gln Asn Cys
 355 360 365
 Ala Ser Phe Val Glu Val Gly Lys Pro Ile Asp Tyr Cys Gln Ile Arg
 370 375 380
 Ile Cys Asn Glu Ala Asn Glu Gly Leu Glu Asp Gly Phe Ile Gly His
 385 390 395 400
 Ile Gln Ile Lys Gly Glu Asn Val Thr Gln Gly Tyr Tyr Asn Asn Pro
 405 410 415
 Glu Ser Thr Asn Arg Ala Leu Thr Pro Asp Gly Trp Val Lys Thr Gly
 420 425 430
 Asp Leu Gly Phe Ile Arg Lys Gly Asn Leu Val Val Thr Gly Arg Glu
 435 440 445
 Lys Asp Ile Ile Phe Val Asn Gly Lys Asn Val Tyr Pro His Asp Ile
 450 455 460
 Glu Arg Val Ala Ile Glu Leu Glu Ile Asp Leu Gly Arg Val Ala Ala
 465 470 475 480
 Cys Gly Val Tyr Asp Gln Glu Thr Arg Ser Arg Glu Ile Val Leu Phe
 485 490 495
 Ala Val Tyr Lys Lys Ser Ala Asp Arg Phe Ala Pro Leu Val Lys Asp
 500 505 510
 Ile Lys Lys His Leu Tyr Gln Arg Gly Gly Trp Ser Ile Lys Glu Ile
 515 520 525
 Leu Pro Ile Arg Lys Leu Pro Lys Thr Thr Ser Gly Lys Val Lys Arg

530 535 540
 Tyr Glu Leu Ala Glu Gln Tyr Glu Ser Gly Lys Phe Ala Leu Glu Ser
 545 550 555 560
 Thr Lys Ile Lys Glu Phe Leu Glu Gly
 565

 <210> 41
 <211> 56
 <212> PRT
 <213> bacteria

 <400> 41
 Leu Val Glu Asp Asp Asp Gly Ala Ala Leu Ile Asp Thr Gly Phe Thr
 1 5 10 15
 Ala Pro Ala Ala Lys Ala Leu Leu Arg Leu Leu Lys Asp Gly Gly Lys
 20 25 30
 Lys Ile Asp Ala Ile Ile Leu Thr His Ala His Ala Asp His Ile Gly
 35 40 45
 Gly Val Pro Glu Leu Leu Glu Arg
 50 55

 <210> 42
 <211> 58
 <212> PRT
 <213> Stenophomonas maltophilia

 <400> 42
 Leu Val Gln Thr Pro Asp Gly Ala Val Leu Leu Asp Gly Gly Met Pro
 1 5 10 15
 Gln Met Ala Ser His Leu Leu Asp Asn Met Lys Ala Arg Gly Val Thr
 20 25 30
 Pro Arg Asp Leu Arg Leu Ile Leu Leu Ser His Ala His Ala Asp His
 35 40 45
 Ala Gly Pro Val Ala Glu Leu Lys Arg Arg
 50 55

 <210> 43
 <211> 52
 <212> PRT
 <213> bacteria

 <400> 43
 Asp Pro Glu Arg Phe Leu Asp Glu Asn Gly Lys Phe Lys Lys Ser Tyr
 1 5 10 15
 Ala Phe Leu Pro Phe Gly Ala Gly Pro Arg Asn Cys Leu Gly Glu Arg
 20 25 30
 Leu Ala Arg Met Glu Leu Phe Leu Phe Leu Ala Thr Leu Leu Gln Arg
 35 40 45

Phe Glu Leu Glu

50

<210> 44

<211> 7

<212> PRT

<213> artificial sequence

<220>

<221> BINDING

<222> (1)..(7)

<223> His binding motif of the active site of NRPS condensation domains

<400> 44

His His Xaa Xaa Xaa Asp Gly

1

5

<210> 45

<211> 31

<212> DNA

<213> artificial sequence

<220>

<221> primer_bind

<222> (1)..(31)

<223> N-oligo PCR primer

<400> 45

cacacagaat tcaccagcgc cactcgcgct t

31

<210> 46

<211> 30

<212> DNA

<213> artificial sequence

<220>

<221> primer_bind

<222> (1)..(30)

<223> C-oligo PCR primer

<400> 46

cacacatcga tgggcaacgc cgatcagccg

30